MFS Port Pirie Station

Detailed Site Investigation

South Australian Metropolitan Fire Service

February 01, 2024

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Executive Summary

Background

GHD Pty Ltd (GHD) was engaged by the South Australian (SA) Metropolitan Fire Service (MFS) to undertake a Detailed Site Investigation (DSI) for the Port Pirie Fire Station, located at 97 Grey Terrace, Port Pirie South, South Australia 5540 (the site).

In 2022, GHD undertook a site history review of 17 MFS sites (GHD 2022) and inspections of eight metropolitan sites to support environmental risk profiling using a multi-criteria analysis approach. The work was required to address the potential risks associated with former use of aqueous film-forming foam (AFFF) containing per- and poly-fluoroalkyl substances (PFAS). The sites were prioritised to assist with the implementation of appropriate assessment and management measures to address the potential PFAS risks. The Port Pirie station was identified as high priority due to a high historical on-site use and storage of AFFF concentrate, shallow groundwater depth and risk of AFFF infiltration to groundwater, historical on-site training, close proximity of wetland north of the site which receives stormwater from the site, surrounding residential land use and identified soil impacts.

Objectives

The objective of this investigation is to address the SA EPA's requirement to undertake a DSI in order to assess:

– The nature and extent of PFAS contamination, both on- and off-site.
– The potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued industrial use.
– The potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant land uses and environments.

Scope of Work

The following scope of works was undertaken in general accordance with the Sampling and Analysis Quality Plan (SAQP) (GHD 2023b):

– Nine surface soil samples in areas of exposed soil around the boundary of the fire station.
– Advancement of 5 soil bores targeting the rear yard where historical PFAS training activities have occurred.
– Installation of three groundwater monitoring wells.
– Surveying of the three newly installed groundwater monitoring well relative to Australian Height Datum (AHD).
– Disposal of waste soil by a licenced contractor.
– Preparation of this DSI.

Determination of Site Contamination

Based on the information presented in this DSI report, it is considered that site contamination exists in relation to PFAS impacts identified in soil and groundwater.

Conclusions

Based on the results of this investigation the following conclusions have been made:

– The lithologies encountered beneath the site during this investigation are consistent with the regional geology, with sand and sandy clay identified below the fill material.
– Shallow groundwater was encountered between 2.45 - 2.55 metres below ground level (m bgl).

- Reported PFAS impacts to soil are likely due to the historical fire-fighting activities undertaken such as training, flushing of vehicles and equipment in the wash down area and storage of PFAS.
- Regarding reported soil results:
  - The highest reported concentrations of PFAS in soils have been identified within the historical training area beneath the concrete apron.
  - An exceedance of human health HIL B assessment criteria was reported in a surface soil sample (SS04) along the western boundary of the site.
  - A total of 25 samples were taken within the 17 sampling sites strategically distributed within the historical training site, wash down area and along the southern and western site boundaries. Out of this, six samples have yielded concentration values exceeding the standard values for indirect ecological exposure and three samples yielded concentration values exceeding the indirect ecological exposure- developed sites.
  - Concentration of PFOS was recovered from samples at all depths. The maximum depth to which PFOS concentration was still detected was 3.5 m bgl.
  - The elevated concentrations of PFOS on surface to near surface depths signifies the shallow depth concentration and highly dispersive nature of PFAS.
  - Delineation of the vertical and lateral extent and degree of PFAS impacts are subject to further investigation.
  - Potentially complete SPR linkages were identified with respect to the presence of widespread ecological criteria exceedances. The potential risk of exposure to ecologically significant receptors therefore can't be ruled out and further work is likely required to assess potential risks and impacts to the environment.
  - Potential mitigation measures in the form an environmental management plan may be required to minimise potential soil exposure to construction and maintenance workers during any work requiring interaction with shallow soils (such as excavation work).
- Regarding reported groundwater results:
  - Groundwater was encountered at relatively shallow depths (approximately 2.5 m bgl) and was measured to be very saline based on review of field measured electrical conductivity.
  - Groundwater flow was in an easterly direction during the sampling event. Changes in inferred flow direction should be assessed with respect to the low and relatively flat hydraulic gradient at the site. The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not yet been confirmed and thoroughly delineated.
  - PFAS contamination in the form of PFOS, PFHxS, and PFOA was reported above the adopted screening criteria for both human health and the environment in all three monitoring wells installed at the site.
  - Potential exposure risks associated with direct abstraction and consumption of groundwater (either for drinking or recreational purposes) was considered unlikely due to the salinity characteristics of groundwater at and in the general area of the site.
  - Additional work would need to be undertaken to confirm the presence/absence of off-site PFAS contamination in groundwater which may be attributable to the site with respect to the potential exposure risk to edible vegetation, groundwater dependant ecosystems and any down gradient groundwater receiving environments. Should it be assessed that site derived PFAS impacts are likely to be discharging to the environment then further work may also be needed to assess bioaccumulation potential of PFAS in fish and other marine animals.

Recommendations

The following recommendations have been made:

- A secondary GME to confirm groundwater flow direction.
- Further intrusive assessment works to delineate the nature and spatial extent of the contamination in soil and groundwater off-site in all directions.

– Sealing of the unpaved areas along the site boundary where most of the samples reported high PFAS concentrations.
– Biota sampling and potential removal of indigenous species *Santalum acuminatum* (Quandong) observed along the northern and western property boundaries which is accessible to the public.
– Conduct a groundwater-use survey within the vicinity of the site to evaluate the potential exposure risk attributable to the possible use of groundwater for currently unidentified domestic/recreational purposes.

Limitations

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.6 and the assumptions and qualifications contained throughout the Report.

Table of Abbreviations

Abbreviation	Full Form
AFAC	Australasian Fire and Emergency Service Authorities Council
AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
BYDA	Before You Dig Australia
CCME	Canadian Council of Ministers of the Environment
CoC	Contaminants of Concern
COC	Chain of Custody
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DQIs	Data Quality Indicators
DSI	Detailed Site Investigation
EC	Electrical Conductivity
ECCC	Environment and Climate Change Canada
EPP	Environmental Protection Policy
EV	Environmental Value
GAR	South Australian *Guidelines for the Assessment and Remediation of Site Contamination 2019*
GHD	GHD Pty Ltd
HEPA	Heads of Environment Protection Authorities Australia
HDPE	High-Density Polyethylene
HIL	Human Health Investigation Level
IP	Interface Probe
km	Kilometres
LOR	Limit of Reporting
m bgl	Metres Below Ground Level
MFS	South Australian Metropolitan Fire Service
mg/L	Milligrams / Litre
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEMP	PFAS National Environmental Management Plan Version 2.0 - January 2020
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
PCSM	Preliminary Conceptual Site Model
PFAS	Per- and Poly-Fluoroalkyl Substances

Abbreviation	Full Form
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PSI	Preliminary Site Investigation
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SA EPA	South Australian Environment Protection Authority
SAQP	Sampling and Analysis Quality Plan
SARIG	South Australia Resources Information Gateway
SPR	Source-Pathway-Receptor
SSHIL	Site-Specific Health Investigation Levels
SWL	Standing Water Level
TDS	Total Dissolved Solids
TOC	Top of Casing
VSCAP	Voluntary Site Contamination Assessment Proposal
WQEPP	South Australian *Environmental Protection (Water Quality) Policy* 2015
µg/L	Micrograms / litre
µS/cm	Microsiemens / centimetre

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1. Introduction

GHD Pty Ltd (GHD) was engaged by the South Australian (SA) Metropolitan Fire Service (MFS) to undertake a Detailed Site Investigation (DSI) for the MFS Port Pirie Station, located at 97 Grey Terrace, Port Pirie South, South Australia 5540 (the site).

This DSI is limited to potential impacts from the use of aqueous film-forming foam (AFFF) containing per- and poly-fluoroalkyl substances (PFAS) to address the action required by the SA Environment Protection Authority (EPA) letter GENI 62917 (refer to Appendix A). Other potential contaminating activities and related contaminants of concern (CoC) were not included in this assessment.

1.1 Background

The Port Pirie Fire Station was officially opened in 1986 as a fire station providing 24-hour emergency response and community recovery services with a mixture of both full-time and retained firefighters.

Historically, the MFS have used AFFF containing PFAS at the site during training activities. Residual AFFF was also flushed from firefighting appliances on-site subsequent to emergency response incidents. It is understood that the MFS commenced phasing out the use of firefighting foams containing perfluorooctane sulfonate (PFOS) in 2007 and perfluorooctanoic acid (PFOA) in 2014 after consultation with the Australasian Fire and Emergency Service Authorities Council (AFAC) and the SA EPA. The MFS replaced all firefighting foam in 2016 and now use only products designated as being fluorine-free. During 2017/2018, the MFS removed all fire extinguishers containing PFAS.

In 2022, GHD undertook a site history review of 17 MFS sites (GHD 2022), and inspections of eight metropolitan sites to support environmental risk profiling using a multi-criteria analysis approach. The work was required to address the potential risks associated with former use of AFFF containing PFAS. The sites were prioritised to assist with the implementation of appropriate assessment and management measures to address the potential PFAS risks. The GHD 2022 Report was provided to the SA EPA, who subsequently issued a letter dated 1 February 2023 (EPA GENI 62917) with the requirement of “a plan of proposed works and associated timelines to address the highest risk sites” (refer Appendix A). The Port Pirie Fire Station was identified as one of the eight high priority sites.

GHD has completed a Preliminary Site Investigation (PSI) and Sampling Analysis and Quality Plan (SAQP) for the site. This DSI was prepared to address the data gaps identified in the PSI and the scope of works was undertaken in accordance with the SAQP.

1.2 Objectives

The objective was to assess for the presence of PFAS contamination in soil and/or groundwater which may be present at the site as a result of historical firefighting operations and training activities.

1.3 Purpose

The purpose of the investigation was to:

– Respond to SA EPA requirement to undertake a DSI to assess:
  - Assess the nature and extent of identified site contamination, both on- and off-site, associated with the historical use and storage of PFAS containing AFFF.
  - Assess the potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued industrial use.
  - Assess the potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant land uses and environments.

1.4 Scope of Works

The following scope of works was undertaken generally in accordance with the SAQP (GHD 2023b):

– Collection of nine surface soil samples (0 - 0.1 m bgl) from the perimeter of the fire station.
– Advancement of five soil bores on-site, with associated soil logging, target-depth sampling and PFAS analysis.
– Installation and development of three permanent on-site groundwater monitoring wells.
– Sampling and analysis of groundwater samples for PFAS analytes.
– Surveying of the three groundwater monitoring wells relative to Australian Height Datum (AHD).
– Disposal of waste soil and groundwater by a licensed contractor.
– Development of a Conceptual Site Model (CSM), comprising an assessment of PFAS source areas, pathways, and receptors.
– Preparation of this DSI report.

Please note, this DSI has been prepared in accordance with the site's current land use and does not account for future land use changes.

1.5 Person Requesting Works

The investigation was requested by:

Mr Eero Haatainen, Acting Deputy Chief Officer, SA MFS, 99 Wakefield St, Adelaide SA 5000.

1.6 Limitations

This report: has been prepared by GHD for South Australian Metropolitan Fire Service and may only be used and relied on by South Australian Metropolitan Fire Service for the purpose agreed between GHD and South Australian Metropolitan Fire Service as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than South Australian Metropolitan Fire Service arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.6 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Site Information

2.1 Site Identification

Site information details are summarised in Table 2.1 below.

Table 2.1 Summary of General Site Identification Information

Item	Detail
Site Address:	97 Grey Terrace, Port Pirie South, SA 5540
Certificate of Title:	CR 5800/269
Legal Description:	Section 57, Hundred of Pirie in the area named Port Pirie South
Local Government Authority:	Port Pirie Regional Council
Current Zoning:	Employment
Property Owner:	South Australian Metropolitan Fire Service
Current Site Use:	Operational Fire Station
Area:	19,297 m^2
Site Elevation:	8 m AHD

2.2 Site Description

2.2.1 Site Inspection and Description

The site is situated in the suburb of Port Pirie South, located approximately 200 kilometres (km) north-north-west of Adelaide on the Spencer Gulf. The site is located on Grey Terrace and is surrounded by a mix of other emergency services, residential houses, and community parklands. The MFS owns the block of land on which the Port Pirie Fire Station, SA Ambulance Service and North Region State Emergency Service are located. The station has both full-time staff working on 24-hour shifts and retained staff. A site inspection was undertaken on 9 March 2023 and noted the following buildings and features:

– One main one-storey building, located in the north of the site, containing the engine room where appliances exit north to Grey Terrace, office rooms and other informal break rooms.
– A carport in the rear yard, built approximately 15 years ago, along the eastern boundary where foam is currently stored and AFFF would have been previously stored.
– A training tower, located in the middle of the paved area out the back of the site.
– An unsealed paddock immediately south of the southern fence line which may have been used in the past for training or subject to overspray.
– Three stormwater drains were located in the rear yard directing stormwater off-site towards both Grey Terrace and Short Street and subsequently discharging to the Phoenix Park Wetlands.
– Cars were parked under the carport in the back of the site and along the western boundary on Short Street.

The nearest water course is the Phoenix Park Wetlands located approximately 0.5 km north of the site. Site photographs from the site inspection are presented in Appendix B.

2.2.2 Historical use and storage of PFAS

A questionnaire regarding the historical use of AFFF at the site was circulated to MFS staff. The survey was completed on 20 June 2022 by a Senior Fire Fighter, who has been working at the site since 1999, and another firefighter who has been working at the site since 2011. Additionally a site visit was undertaken on the 9 March 2023 to determine site features and layout. Copies of the completed surveys can be found in Appendix C.

MFS staff did not know the exact date in which PFAS containing AFFF was first used at the site, but it is assumed to have been prior to 1999. The AFFF historically used at the site were branded '3M' and another unknown foam (in red 20 L drums only used for training purposes).

Historically training was conducted quarterly each year in the rear training area, which was a paved open yard with drainage to the storm water system. MFS staff were not sure when the last training event including the use of AFFF occurred. The volume of AFFF historically used per training exercise was estimated to be less than 20 L as typically water was used in training exercises. The estimated total volume of AFFF used on-site before it was phased out in 2016 was estimated to be less than 120 L. Training may have also occurred within the unsealed paddock immediately south of the site, however this has not been confirmed.

During the training exercises the AFFF was generally used from a GP pump and dispersed aerially over the south/west portion of the rear yard on-site. AFFF was not used frequently in either training or on call-outs as the time and volume required are often unsuitable for the job.

Foam and wastewater from the training events were flushed into the stormwater system which would direct wastewater off-site. Additionally, wash down / flushing of fire trucks, equipment or AFFF containers occurred directly adjacent to the south of the fire station (rear yard) and wastewater was also discharged to the storm water system off-site. This process has not changed over time.

Historically, twenty 20 L plastic drums and two 200 L plastic drums with AFFF concentrate were stored on-site at any given time prior to 2016. AFFF was ordered on an as-need basis through the MFS Logistics Store.

AFFF drums were pierced, and foam manually pumped to tanks using a plastic hand pump. This process was noted to be messy with small scale spillages each time this was done. Spent AFFF drums were returned to the store.

There is no incident log/register for the site for PFAS related usage or releases.

2.3 Surrounding Land Use

Land use surrounding the site is summarised in Table 2.2. Surrounding land uses is shown on Figure 1 at the end of the report.

Table 2.2 Land Uses and Zoning

Orientation	Description of Land Use	Zoning (Municipal Council)
North	North of the site is Phoenix Park/Port Pirie Harness Racing Club. Surrounding of the racetrack to the north and east is the Phoenix Park Wetlands. 21 tennis courts are located west of the racetrack. Port Pirie Netball Association lies at the intersection of Wandearah Road and Grey Terrace. North of the wetlands is a TAFE SA campus, aquatic centre, and sports grounds. East of the wetlands is an Aldi store and rail line. West of the wetlands is a tennis club and residential housing.	Community Facilities
East	Directly east is Pirie Plaza Shopping Centre and various commercial businesses, including a supermarket, service station and auto repairs stores. A football club and oval are southeast of the site.	Employment
South	Immediately south is a mix of commercial and residential properties, including mechanical repairs stores, beauticians, and a pet store. Further southeast is also commercial, with businesses including retail stores, take away restaurants and a fire equipment maintenance store. South and southwest is predominantly residential.	Employment Suburban Neighbourhood
West	West and northwest of the site are predominantly residential with a few businesses along The Terrace, including a Military Museum, service station and sporting club.	Suburban Neighbourhood

3. Previous Investigations

Previous PFAS investigations at the Port Pirie Fire Station were carried out by GHD in 2019, 2022 and 2023, and are documented in the following reports:

– GHD (2019) *MFS State-wide Appliance and Station Sampling*, Report for South Australian Metropolitan Fire Service, May 2019.
– GHD (2022) *MFS 17 Fire Stations PFAS Risk Profiling*, Report prepared for the South Australian Metropolitan Fire Service by GHD Pty Ltd, October 2022.
– GHD (2023a) *MFS Port Pirie Fire Station Preliminary Site Investigation*, Report prepared for the South Australian Metropolitan Fire Service by GHD Pty Ltd, June 2023.
– GHD (2023b) *MFS Port Pirie Fire Station Sampling and Analysis Quality Plan*, Report prepared for the South Australian Metropolitan Fire Service by GHD Pty Ltd, July 2023.

Locations sampled at the Port Pirie Fire Station as part of these investigations are presented in Figure 2 at the end of the report.

3.1 GHD (2019) MFS State-wide Appliance and Station Sampling

Port Pirie Fire Station was part of the GHD 2019 environmental investigations carried out at 35 fire stations across South Australia to assess PFAS concentrations that may remain in firefighting appliances, accessible soil and any biota (fruit, vegetables, herbs and poultry) if present.

It is noted that the 2018 PFAS NEMP guidelines were used in this report, which were superseded by the 2020 PFAS NEMP 2.0. The outcomes of the sampling program were as follows:

– Four soil samples (Port Pirie_1 to Port Pirie_4) were collected from the western and southern boundary. Two of the soil samples (Port Pirie_3 and Port Pirie_4) reported detectable PFAS concentrations which exceeded the PFAS NEMP Ecological Indirect exposure guidelines for PFOS. No other criteria exceedances were reported.
– Four samples were collected from appliances at the site, of which one exceeded the PFAS NEMP drinking water guidelines for PFOS and Sum of perfluorohexane (PFHxS) and PFOS. It should be noted that all appliances have been decontaminated from historical PFAS usage.

3.2 GHD (2022) MFS 17 Fire Stations PFAS Risk Profiling

The Port Pirie fire station was part of a 2022 desktop risk assessment and multi-criteria analysis (MCA) carried out at 17 MFS fire stations across South Australia to support appropriate risk management approaches associated with potential or identified PFAS contamination. The 17 sites required for prioritisation, including Port Pirie, were identified by the SA EPA in the letter GENI 62485 dated 21 October 2021.

The report presented the methodology and findings of the PFAS risk profiling for the 17 MFS fire stations with identified PFAS impacts in soil. The desktop review focused on identifying historical sources of PFAS contamination, potentially sensitive human or ecological receptors in the vicinity of the sites and the source-pathway-receptor linkages that may be present.

The report provided a summary of the site prioritisation for further assessment based on their potential to cause harm to the environment and/or human health. The Port Pirie Fire Station was classified as high-risk with high priority for further investigation of PFAS contamination for the following reasons:

– High historical on-site use and storage of AFFF concentrate.
– Shallow groundwater depth and risk of AFFF infiltration to groundwater.
– Historical on-site training on unsealed surfaces.

– Close proximity of wetland north of the site which receives stormwater from the site.
– Surrounding residential land use.

3.3 GHD (2023a) MFS Port Pirie Fire Station Preliminary Site Investigation

A preliminary site investigation was undertaken to review historical site activities which may have contributed to PFAS contamination at the site and potentially off-site. The preliminary site investigation included the following scope of works:

– Desktop assessment of site history and historical activities which may have contributed to PFAS contamination of the site and surrounds.
– Review of available information regarding local geology, hydrogeology and soil.
– A site inspection and interviews with site personnel to confirm features and historical PFAS use areas documented in the desktop review.
– Development of a preliminary conception-site model (PCSM) comprising an assessment of PFAS source areas, pathways and receptors.

The findings of the PSI are summarised below:

– Documented information confirmed the storage of PFAS containing AFFF at the site prior to 1999.
– Storage of AFFF on-site was noted as approximately twenty 20 L plastic drums and two 200 L plastic drums.
– Minimal soil sampling has been undertaken on-site with samples reporting results below the HIL D (commercial/industrial) and HIL B (residential with limited open soil) assessment criteria, however exceeding the ecological indirect exposure guidelines in two samples.
– While soil on-site has confirmed the presence of PFAS, the extent of PFAS in soil and the potential for groundwater impacts has not yet been determined.

The PCSM identified the following potentially complete PFAS exposure pathways:

– Exposure of site users, visitors, maintenance and construction workers to PFAS via direct dermal contact with contaminated soil, incidental ingestion of contaminated soil or inhalation of contaminated soil / dust from disturbed soils.
– Leaching of PFAS from contaminated soils or concrete / bitumen surfaces followed by migration through porous media into groundwater.
– Consumption of contaminated groundwater extracted off-site for domestic / drinking purposes.
– Consumption of edible vegetation grown off-site where plants were irrigated with contaminated groundwater or where plant roots accessed shallow contaminated groundwater.
– Incidental ingestion of contaminated groundwater extracted off-site for recreational purposes such as filling of swimming pools.

3.4 GHD (2023b) MFS Port Pirie Fire Station Sampling and Analysis Quality Plan (SAQP)

Following finalisation of the PSI, a Sampling Analysis and Quality Plan (SAQP) was prepared to undertake intrusive investigations for the delineation of the lateral and vertical extent of PFAS contamination on- and off-site.

The purpose of the SAQP was to present the scope of work, methodologies, and sampling rationale to be utilised during the further intrusive works for this DSI to meet the investigation objectives.

Based upon the PCSM provided in the PSI, the following data gaps were identified:

– The lateral and vertical extent of PFAS contamination in groundwater has not been determined.
– The lateral and vertical extent of PFAS contamination in soil has not been delineated.
– The uptake of PFAS by on and off-site vegetation has not been assessed.

- The degree of PFAS contamination in on-site concrete and bitumen surfaces and the associated PFAS flux from these materials has not been assessed.
- The potential for PFAS to leach from contaminated soil into groundwater has not been tested yet.
- The extent of groundwater use for domestic (i.e. potable), irrigation or recreational purposes downgradient of the site remains unknown.

4. Environmental Setting

4.1 Topography and Hydrology

The topography of the site and surrounding land is relatively flat. The portion of land south of the site has an elevation of about 10 m AHD and gently slopes towards the north to approximately 8 m AHD (GHD 2023a).

The site comprised of mostly sealed surfaces, including buildings, concrete pavers and concrete hardstand, with open garden beds along the northern and western boundaries. Stormwater discharges off-site to underground stormwater via on-site drains. Stormwater drains are located in the rear yard and along both Grey Terrace to the north and Short Street to the west.

4.2 Site Drainage

The site was observed to be relatively flat, with a gentle slope down to Short Street at the rear yard access and to Grey Terrace from the front apron. The engine room is relatively flat and has no drainage points meaning water tends to pool and is manually pushed out to the front apron.

During a site inspection on the 9 March 2023, the rear training yard was paved with concrete pavers (~70%) and concrete hardstand (~30%) and was used for training and appliance flushing. Two stormwater drains were observed in the rear yard which directed water 0.5 km north to the Phoenix Park Wetlands (artificial wetlands with stormwater outlets). A third stormwater drain was located in the central eastern portion of the site. There have been no changes to the stormwater management at the site over time and stormwater has not been harvested.

4.3 Surface Water

The nearest surface waterbody is the Phoenix Park Wetlands located approximately 0.5 km north-east of the site (Lotsearch 2023). The site inspection reported that stormwater discharges to the wetland area as part of stormwater retention. Further north is the Phoenix Park Wetlands, approximately 0.5 km north of the site which flows north to the Spencer Gulf.

4.4 Regional Geology

On-site soils are classified as hydrosol, located within the Coastal Plain, by the Atlas of Australian Soils. The soil unit comprises saline clays (Uf6.61), lesser areas of crusty loamy soils (Drl.13) on the land-side and calcareous sands (Uc1.11) along the coast. The on-site geology is described as Undifferentiated Quaternary alluvial/fluvial sediments (GHD 2023a).

The site lies within a region of high probability (>70%) of potential acid sulphate soil occurrence.

4.5 Hydrogeology

As indicated in the PSI report (GHD 2023a), the site is within an area where groundwater aquifers are described as sedimentary rocks with basins including limestone, often cavernous, sandstone, sand shale and clay. The site lies on a shallow sedimentary groundwater basin.

A search of the South Australian Resources Information Gateway (SARIG 2023) database reported shallow groundwater in the vicinity of the site with standing water levels (SWL) of 2-5 m bgl, producing yields in the range of 0-0.5 L/second. Groundwater salinity ranged from 35,000 to 200,000 ppm total dissolved solids (TDS), indicating saline water.

4.6 Local Groundwater Users (WaterConnect Database)

A Lotsearch report undertaken as part of this investigation included a search of the South Australian WaterConnect database (DEW 2022) for registered groundwater wells located within a 2.0 km radius of the site. The results are summarised as follows:

- There were 355 registered wells within a 2.0 km radius.
- Of these registered wells, 28 were listed as abandoned, 15 were listed as backfilled, 3 were dry, 78 were listed as having an unknown status and no status was listed for 231 wells.
- Of the registered wells with unknown or no registered status, four were listed as industrial, 94 were listed as investigation, 79 were listed as monitoring, 30 were listed as observation and 94 had no listed purpose.
- Of the 43 wells listed as abandoned or backfilled three were listed as investigation, 21 were listed as monitoring, 13 were listed as observation and six had no listed purpose.
- TDS data was available for 35 wells within the 2.0 km radius from the site and ranged between 2,827 mg/L and 103,020 mg/L, indicating saline water. The lowest TDS value of 2,827 mg/L was reported for well number 6531-972, located approximately 1.1 km south-east of the site.
- Reported SWL for all wells were between 0 m bgl (6531-972) and 30 m bgl (6531-1005).

5. Assessment Criteria

The contaminants of concern (CoC) in this investigation were limited to PFAS. As such, assessment criteria were adopted from the following documents:

– HEPA 2020, PFAS National Environmental Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (PFAS NEMP).
– NHMRC 2011, Australian Drinking Water Guidelines 6 (ADWG), Version 3.7, National Water Quality Management Strategy, National Health and Medical Research Council and Natural Resources Management Ministerial Council, Commonwealth of Australia, updated September 2022.
– GHD 2023c, Derivation of Site-specific Health Investigation Levels for Urban and Regional Fire Stations – South Australian Metropolitan Fire Service (SA MFS), June 2023.

5.1 Soil

In accordance with the PFAS NEMP 2020, the PFAS assessment criteria listed in Table 5.1 have been adopted for the assessment of soil samples.

Table 5.1 Adopted PFAS Assessment Criteria – Soil

Exposure scenario	PFHxS[1] mg/kg	PFOS[2] mg/kg	Sum of PFOS and PFHxS mg/kg	PFOA[3] mg/kg	Reference Document
Human Health Investigation Levels (HIL)					
Human health investigation level B – Residential with limited soil contact	2	2	2	20	PFAS NEMP (HEPA 2020)
Human health investigation level D – commercial Industrial	20	20	20	50	
Site-specific HILs[4] for the screening of PFAS contaminated soils at SA MFS sites (Metropolitan, Staffed)	-	-	14	50	Derivation of site-specific health investigation levels for urban and metropolitan fire stations (GHD, June 2023)
Ecological Screening Levels					
Ecological indirect exposure		0.01[4]			PFAS NEMP (HEPA 2020)
Ecological direct exposure		1		10	

Notes:
[1] PFHxS – perfluorohexane sulfonate
[2] PFOS – perfluorooctane sulfonate
[3] PFOA – perfluorooctanoic acid
[4] Discussed further in section 5.1.1

The typical usage patterns at SA MFS fire stations most closely align with the exposure assumptions that underpin HIL D (Industrial/Commercial) values. The following inconsistencies are however noted:

– The preliminary site investigations undertaken at SA MFS sites across South Australia has identified that some fire stations have a higher proportion of unsealed ground (up to approximately 75% of the total site area) than has been assumed in the derivation of the HIL D values (up to approximately 20% of the total site area). As a result of this, there may be greater opportunities for direct access to soil at SA MFS fire stations, including the ingestion of soil and soil-derived dust.
– The shifts worked by SA MFS firefighters do not align with the assumption of a standard working week than underpins the HIL D values.

Given these factors, Site-specific Health Investigation Levels (SSHILs) have been derived using exposure assumptions that reflect the typical usage pattern of the SA MFS fire stations, to allow for a more accurate

assessment of the health risks that may be associated with the presence of PFAS in shallow soils (GHD 2023c). Further discussion regarding the development of the SSHILs is provided in Section 5.1.1.

GHD has made reference to both the ecological direct exposure and indirect exposure scenario criteria within the PFAS NEMP (2020) to assess potential ecological exposure risks. These generic criteria apply to all land use scenarios. Further discussion regarding these criteria are provided in Section 5.1.2.

5.1.1 Site Specific Human Health Soil Guideline Values

The PFAS NEMP (Section 8, 2020) provides nationally agreed guideline values that are to be used to inform site investigations. The human health-based investigation levels for soil were derived using a methodology consistent with assumptions set out in the ASC NEPM for the health investigation levels (HILs).

As noted above, the GHD letter report titled *Derivation of site-specific Health Investigation Levels (HILs) for urban and regional fire stations* (GHD, 2023c) outlines site-specific HILs for the two categories of SA MFS fire stations, namely metropolitan and regional, also referred to as “staffed” and “retained”, respectively. The methodology and associated exposure assessment processes are outlined in GHD 2023c. The SSHILs will be adopted in place of the generic HIL D (commercial/industrial) guidelines from the PFAS NEMP 2.0.

GHD understands that the MFS, in consultation with the United Fire Fighters Union of South Australia, have agreed to also adopt a more stringent health investigation level (i.e. HIL B – residential with minimal opportunities for soil access) as a “trigger” for further engagement. This has been included at the direction of MFS and is for comparison purposes only.

Currently, there are no specific criteria for the assessment of concrete/pavers with regard to human health or ecological risk. Sampling of these media is conducted to assess their potential contribution as a flux source of residual PFAS impacts to the environment via leaching.

5.1.2 Ecological Soil Guideline Values

The PFAS NEMP provides the following guidance regarding ecological risk for soils:

– For intensively developed sites with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg may be appropriate.
– The indirect exposure value may be over-protective if the area of exposed soil is too small to have any material impact on food chain transfer to secondary consumers such as invertivores and carnivores. In this situation, considering site-specific characteristics may justify the use of a higher value (up to 0.14 mg/kg) as the trigger for a detailed site-specific investigation of risk.

The PFAS NEMP does not provide a rationale for the selection of the 0.14 mg/kg, however GHD notes that this value was sourced from the same document as the other ecological criteria, namely Environment and Climate Change Canada (ECCC 2017) *Federal Environmental Quality Guidelines Perfluorooctane Sulfonate (PFOS)*. This document provides 0.14 mg/kg as the soil guidelines for PFOS in two circumstances:

– Soil Quality Guideline to Protect Freshwater Life under all land uses.
– Soil Quality Guideline for Off-site migration under commercial/industrial land uses.

The soil quality guideline to protect freshwater aquatic life is the concentration in soil that is expected to protect against potential impacts on freshwater aquatic life from PFOS originating in soil that may enter the groundwater and subsequently discharge to a surface water body. The calculation of this value was made on the basis of the Canadian aquatic screening criteria for PFOS in surface water (6.8 ug/L) and a reverse fate and transport modelling process that assumes a minimum of 10 m lateral separation between the source and the surface water body and incorporates default parameters describing partitioning from soil to leachate, leaching to groundwater, mixing with groundwater and plume migration. The protection of aquatic life from soil impacts via migration in groundwater will be included in a groundwater assessment at the site. The closest aquatic receptor is the Phoenix Park Wetlands, located approximately 0.5 km from the site.

The soil quality guideline for off-site migration under commercial/industrial land uses considers the potential that wind and water erosion of soil can move PFOS contaminated soil from one site to another. The endpoint used to calculate this guideline is the soil quality guideline protective of ecological receptors in residential and agricultural

land use settings (0.01 mg/kg - the ecological indirect criteria). A model was then used to predict the movement of soil, including the Universal Soil Loss Equation and the Wind Erosion Equation. CCME (2017) specifically states that this approach is imprecise and that the derived values should be used as a check mechanism only, with professional judgement used to assess whether this is likely to be a migration pathway of concern for an individual site.

Although the CCME (2017) guidelines have been superseded, the more recent guidelines (Specific Criteria Document for the Development of the Canadian Soil and Groundwater Quality Guidelines for the Protection of Environmental and Human Health - Perfluorooctane Sulfonate) use a similar approach and derive comparable values. The reference to the CMME (2017) for this document is to maintain consistency with the PFAS NEMP 2.0 and the original reference material within that document.

5.2 Groundwater

5.2.1 Environmental and Human Health Guideline Values for Groundwater

The South Australian Environment Protection (Water Quality) Policy 2015 (and amendments) (SA EPA 2015) (EPP) details the regulatory requirements for the protection of all water bodies (surface and groundwater) under the Environment Protection Act 1993. The Policy outlines the applicable environmental values (EVs) for a range of waters, including public stormwater and irrigation drains as well as providing definitions of harm, types of pollutants and the provisions that a person must comply with in taking all reasonable and practicable measures to prevent or minimise harm to aquatic systems.

Table 5.2 outlines the EVs for various waters as described in Schedule 1 of the EPP.

Table 5.2 Environmental values of particular waters (Extract from Schedule 1, Table 3 WQEPP)

Waters	Aquatic ecosystems	Recreation and aesthetics	Drinking water for human consumption	Irrigation and general use	Livestock watering	Aquaculture and aquatic food production
Marine waters	X					X
Surface waters	X		X	X	X	X
Surface waters (Protection areas[1])	X	X	X	X	X	X
Public stormwater systems	X	X				
Groundwaters						
TDS < 1,200 mg/L			X	X	X	X
TDS between 1,200 – 3,000 mg/L				X	X	X
TDS between 3,000 – 12,000 mg/L					X	X

Note: [1] Water protection area means a part of the State for the time being declared by proclamation to be a water protection area (EPA 1993).

While not identified specifically in the EPP, contaminated site assessments typically take into account the potential for abstraction of groundwater for recreational use and migration to aquatic ecosystems so these EVs are included in the assessment process.

To assess the contamination status of groundwater at a site, the GAR (SA EPA 2019a) provides a four-step process to determine the environmental values of groundwater and if actual or potential harm to groundwater that is not trivial has occurred. The four-step process provided in the GAR is described in Table 5.3.

Table 5.3 Four-Step Process for Determining Environmental Values of Groundwater

Process	Assessment
Step 1: Apply Table 3 of Schedule 1 of the 2015 Water Quality Environment Protection Policy (WQEPP, Gov SA 2015) based on TDS ranges	The PSI report (GHD 2023a) report listed 355 registered bores located within a 2.0 km radius of the site. A total of 35 registered bores within the survey area had documented TDS data, ranging from 2.827 mg/L to 103,020 mg/L, indicating saline water.
Step 2: Assess and identify surface water bodies within a 2 km buffer of the site	The nearest water body is the Phoenix Park Wetlands, 0.5 km north of the site (GHD 2023a).
Step 3: Review registered groundwater users in the Water Connect database	A review of the Water Connect database identified a total of 355 registered bores within a 2.0 km radius of the site (WaterConnect 2023). The identified uses of the bores with unknown or no registered status were industrial (4), investigation (94), monitoring (79), observation (30), recharge (8) and no listed purpose (94).
Step 4: Application of the SA EPA recognised criteria for the most sensitive environmental value	The most sensitive environmental values to be applied to the site are PFAS NEMP 2020 Drinking Water for human health. The most sensitive environmental value for ecological receptors is the 99% freshwater ecological guidelines.

Based on the assessment outlined in Table 5.3, groundwater criteria have been selected to protect the most sensitive environmental value identified for groundwater underlying the area of investigation, i.e. drinking water.

For the purpose of this investigation, criteria have been included to:

– Assess the potential risk to people using groundwater for domestic and drinking purposes, (i.e. potable use).
– Assess the potential risk to people using groundwater for recreational purposes (i.e. filling of swimming pools, discharge of groundwater to surface water bodies which are used for recreational activities).
– Assess the potential risk to users of groundwater for irrigation of edible vegetation.

The adopted groundwater screening/investigation levels, which are considered to protect potentially complete source receptor linkages, are summarised in Table 5.4.

Table 5.4 Adopted PFAS Interim Screening Criteria for Groundwater

Exposure Scenario	PFOS[1]	PFHxS[2]	Sum of PFOS and PFHxS	PFOA[3]	Source
Human Health – Recreational Water (domestic)[4]	0.7 µg/L	0.7 µg/L	0.7 µg/L	5.6 µg/L	NHMRC 2008 ADWG (NHMRC 2011)[5]
Human Health – Drinking Water[5]	0.07 µg/L	0.07 µg/L	0.07 µg/L	0.56 µg/L	PFAS NEMP (HEPA 2020) ADWG (NHMRC 2011)
Marine waters 99% Species Protection - Slightly to moderately modified ecosystems	0.00023 µg/L	-	-	19µg/L	PFAS NEMP (HEPA 2020)
Marine waters 95% Species Protection – Slightly to moderately modified ecosystems	0.13 µg/L	-	-	220 µg/L	PFAS NEMP (HEPA 2020)

Notes:
[1] PFOS – perfluorooctane sulfonate
[2] PFHxS – perfluorohexane sulfonate
[3] PFOA – perfluorooctanoic acid
[4] The NHMRC 2008 Guidelines for Managing Risks in Recreational Water recommend health guideline values for recreational water that correspond to 10 times the current drinking water guideline value. These guideline values apply in a domestic setting where groundwater is used for recreational purposes such as the filling of swimming pools.
[5] Australian Drinking Water Guidelines 6, Version 3.7, updated January 2022

6. Soil Investigation

6.1 Soil Sample Locations and Rationale

The soil investigation works described in this section were conducted between 20 and 21 September 2023 under the supervision of an experienced GHD environmental professional. A total of nine surface soil samples (SS01 - SS09) were collected from the east, south and west of the site. Five bores (BH01 to BH05) were drilled as part of the soil investigation. The investigation locations are shown on Figure 2 at the end of the report.

A description of the soil bore locations is provided in Table 6.1 below.

Table 6.1 Soil Bore Locations and Rationale

Proposed Soil Bore ID	Location Description
BH01	Northern end of historical training and appliance flushing area - concrete hardstand
BH02	Central-west side of historical training and appliance flushing area - concrete pavers
BH03	Sample on concrete hardstand adjacent to likely impacted area from historical PFAS use
BH04	Sample east of appliance flushing bay and historical training footprint
BH05	Centre of historical training and appliance flushing area - concrete pavers
MW01	South-eastern corner of the site targeting the historical training and appliance flushing area
MW02	North-eastern corner of the site targeting the historical training and appliance flushing area
MW03	North-western corner of the site targeting the historical training and appliance flushing area
SS01	Western boundary of property to assess surface impacts from historical training
SS02	
SS03	
SS04	
SS05	Southern boundary of station to assess surface impacts from historical training
SS06	
SS07	
SS08	South-east of the site within adjacent property to assess off-site surface soil impacts from historical training activities
SS09	

GHD notes the number of soil sampling locations was in accordance with the NSW Sampling Design Guidelines requirement for the minimum number of sampling locations for a site with a total area of approximately 19,297 m^2.

6.2 Methodology

The methodologies detailed below are in accordance with the following guidelines:

– NEPM 2013, National Environment Protection (Assessment of Site Contamination) Measure, Australian Government, amended 11 April 2013. www.nepc.gov.au/nepms/assessment-site-contamination.

– ANZG 2018, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, online resource www.waterquality.gov.au/anz-guidelines, Australian and New Zealand Governments, updated 26 July 2021, (AWQG).

– Gov SA 2015, Environment Protection (Water Quality) Policy 2015 (WQEPP), Version 1.7.2020, Government of South Australia, updated 2020.

– NHMRC 2008, Guidelines for Managing Risks in Recreational Water, National Health and Medical Research Council and Natural Resources Management Ministerial Council, Commonwealth of Australia, updated with the recent changes in the ADWG – V3.8 – September 2022.

– SA EPA 2019a, Guidelines for the Assessment and Remediation (GAR) of Site Contamination, Environment Protection Authority, South Australia, November 2019.
– SA EPA 2019b, Guidelines for Regulatory Monitoring and Testing – Groundwater Sampling, Environment Protection Authority, South Australia, 2019.
– NSW EPA 2022, Sampling Design Guidelines for Contaminated Land, Environment Protection Authority, New South Wales, August 2022.

The soil investigation conducted as part of the DSI comprised the following aspects:

– Prior to any intrusive works being undertaken, a review of Before You Dig Australia (BYDA) plans was conducted, and all investigation locations were cleared for underground services by an accredited service locator (Veris Australia Pty Ltd) to ensure safe drilling conditions.
– Soil bores were advanced by means of hand auger and utilising an Eziprobe drill rig (push-tube drilling technique), operated by WB Drilling Pty Ltd. Where required, concrete pavers were cored to access the underlying soil media.
– Where push-tube drilling was employed, high density polyethylene (HDPE) core liners were used to retrieve soil cores to minimise the risk of PFAS cross-contamination.
– The hand auger was decontaminated prior to use and between bore locations to prevent cross contamination. Decontamination of the hand auger involved scrubbing in a phosphate-free Liquinox solution and potable water, followed by a rinse with de-ionised water.
– Soils recovered from each soil bore were logged by an experienced GHD environmental professional to assess the underlying geology and contaminant indicators in accordance with AS 1726:2017.
– Representative soil samples were collected at regular depth intervals and/at each new soil horizon for potential laboratory analyses.
– A fresh pair of disposable gloves were worn by the sampler when collecting samples. Soil samples were placed in laboratory-supplied sampling jars suitable for PFAS analysis.
– Soil samples were stored under chilled conditions in an esky and transported to analytical laboratories under chain of custody documentation.

In addition to the soil sampling program, 8 concrete samples were taken from locations which required concrete coring. These samples were broken into small fragments and placed into laboratory supplied sampling containers. The samples were then managed in accordance with the above methodology for future testing, if required.

6.3 Soil Analytical Program

The analytical laboratories used for the soil investigation were Eurofins (primary laboratory) and ALS Laboratory Group (ALS) (secondary laboratory). Both laboratories are registered by the National Association of Testing Authorities (NATA) and the analyses conducted were within their NATA registration.

Two samples from each location were submitted for laboratory analysis of PFAS (Extended Suite). This resulted in the analysis of 25 primary soil samples (including those obtained from bores advanced for groundwater monitoring wells) and 3 duplicate pairs as part of QA/QC protocol. A further discussion of the quality assurance (QA) and quality control (QC) procedures undertaken is presented in Section 8.

6.4 Soil Sampling Results

6.4.1 Subsurface Conditions

Subsurface conditions encountered during the soil investigation were as follows:

– Fill material (primarily gravelly sand or sand) was noted beneath the concrete surface to a depth of 0.4 m bgl in the south-western and north-eastern areas of the site, and 1.0 m bgl across the rest of the site.
– Natural clay to sandy clay was encountered to depths of approximately 1.2 m bgl across the site, with the exception of BH05.

– Natural clayey sand to sandy silt was encountered to depths of 2.4 to 2.7 m bgl across the site, with the exception of MW02 and MW03 where it was observed to a depth of 1.4 m bgl.
– A sandy lens was observed beneath the fill material in BH02 and BH03 to a depth of 0.8 m bgl.
– No evidence of staining or the presence of any distinguishable olfactory odours were noted during sampling.

Additional details of the lithological layers observed during the soil sampling program can be found in Table 6.2 and the borelogs in Appendix D.

Table 6.2 Summary of Lithologies Encountered

Depth (m bgl)*	Soil Type	General Soil Description
0 - 0.4	Gravelly SAND	FILL: fine to medium, poorly graded, pale grey - brown
0.4 - 1.0	SAND	FILL: well graded, orange-brown, some medium gravel
1.0 - 1.2	CLAY/Sandy CLAY	NATURAL: low to medium plasticity, fine to medium, mottled grey-brown
1.2 - 2.4	SAND/Sandy SILT	NATURAL: fine to medium, poorly graded, orange-brown to grey-brown to yellow with some mottling and poorly graded gravel
2.4 - 3.4	Silty CLAY	NATURAL: medium plasticity, fine to medium, grey - brown with grey-yellow to grey-brown mottling
3.4 - 4.0	CLAY	NATURAL: low to medium plasticity, brown

Note: * Approximate depths. Detailed soil borehole logs can be found in Appendix D.

6.4.2 Analytical Results

The exceedances of the adopted assessment criteria protective of human health and the environment are presented in Table 6.3. A figure showing exceedances with respect to each borehole location is presented in Figure 3 at the end of the report. PFAS concentrations in all remaining soil samples were reported to be below the laboratory reporting limits or below the adopted assessment criteria.

The laboratory certificates for the soil analytical results, along with chain of custody (COC) and sample receipt notifications are provided in Appendix F. A full set of tabulated analytical results can be found in Appendix G.

Table 6.3 Results Above Adopted PFAS Assessment Criteria

Location	Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFOA (mg/kg)	Sum of PFOS and PFHxS (mg/kg)
BH01	0.1	0.044	0.6	0.0067	0.644
BH02	0.1	0.0064	1.1	<0.005	1.1064
BH02	2.0	0.24	0.19	0.013	0.43
BH05	0.1	<0.005	0.28	<0.005	0.28
BH05	1.0	0.53	1.4	0.029	1.93
FD02 (intra-laboratory duplicate)	1.0	0.26	0.92	0.016	1.18
FS02 (inter-laboratory duplicate)	1.0	0.384	1.62	0.0258	2.00
MW01	1.5	0.35	0.91	0.022	1.26
FD06 (intra-laboratory duplicate)	1.5	0.43	1.1	0.031	1.53
FS06 (inter-laboratory duplicate)	1.5	0.307	0.821	0.0199	1.13
MW02	0.1	<0.005	0.19	<0.005	0.19
SS04	-	0.23	5.6	0.055	5.83

Notes:
Dark blue depicts exceedances of PFAS NEMP 2.0 2020 Ecological indirect exposure.
Light blue depicts exceedances of PFAS NEMP 2.0 2020 Ecological direct exposure.
Yellow depicts exceedances of PFAS NEMP 2.0 2020 Residential with minimum opportunities for soil access (HIL B).

7. Groundwater Investigation

7.1 Groundwater Well Locations and Rationale

Three groundwater wells (MW01 – MW03) were installed at the site in September 2023 under the supervision of an experienced GHD environmental professional:

– One permanent well (MW01) located in the south-eastern corner of the site targeting the historical training and appliance flushing area.
– One permanent well (MW02) located in the north-eastern corner of the site targeting the historical training and appliance flushing area.
– One permanent well (MW03) in the north-western corner of the site targeting the historical training and appliance flushing area.
– These wells were installed to enable the calculation of the local groundwater flow direction and to assess whether PFAS in groundwater is migrating off-site.
– Survey of the three groundwater monitoring wells relative to Australian Height Datum (AHD).
– All permanent wells were installed in accordance with the Minimum Construction Requirements for Water Bores in Australia (4th Edition, NUDLC 2020).

The location of the monitoring wells is shown on Figure 2 at the end of the report.

7.2 Well Installation Methodology

All groundwater monitoring wells were drilled and installed by WB Drilling Pty Ltd under the supervision of an experienced GHD environmental professional. The drilling method used included hand auger and push-tube to the base of the boreholes. Well permits were obtained from the Government of South Australia's Department of Environment and Water. Copies of well permits are provided in Appendix H. The well construction methodology is outlined below:

– Each monitoring well was drilled to a depth of approximately 4 m bgl. The water strike was determined through various observations including appearance of water and changes in soil moisture content.
– 3 m slotted class 18 PVC screens were installed from the base of the boreholes with solid class 18 PVC casing to the surface. This length was considered adequate to account for seasonal groundwater level variations.
– A gravel pack was installed around the screen, extending from the base to 1.0 m bgl.
– A bentonite plug was installed above the sand pack to protect the aquifer from any direct infiltration of surface water into the well screens.
– A lockable gatic cover was installed and concreted in place, approximately flush to the surrounding ground surface.
– Following installation, the groundwater wells were developed to remove excess silt/entrained sediments and to ensure representative groundwater was flowing into the well. The wells were developed using a decontaminated steel bailer. The bailer was decontaminated between well locations using a phosphate-free detergent and subsequently rinsed with tap water, followed by de-ionised water.
– Groundwater wells were surveyed by a licensed surveyor (Linkup Construction Surveys Pty Ltd). The survey results are included in Appendix I.

Table 7.1 below presents a summary of the construction details along with survey details (elevation) of the wells. Groundwater well construction logs are presented in Appendix D.

Table 7.1 Well Construction Details

Well ID	Well Construction Permit No.	Installation Date	Installation Depth (m bgl)	Screen Interval (m bgl)	Co-ordinates (GDA20 Z54)		Ground Level (m AHD)	TOC (m AHD)
					Easting	Northing		
MW01	448399	20/09/2023	4.0	1.0 – 4.0	220809.062	6323616.997	3.079	2.975
MW02	448400	20/09/2023	4.0	1.0 – 4.0	220789.928	6323642.176	3.061	2.962
MW03	448401	20/09/2023	4.0	1.0 – 4.0	220808.454	6323651.391	3.075	2.995

7.3 Groundwater Sampling Methodology

Groundwater samples were collected in accordance with GHD's standard operating procedures for groundwater sampling and SA EPA guidelines for regulatory monitoring and testing – Groundwater sampling (SA EPA 2019b).

All groundwater wells were left for a minimum of seven days following well development to allow for the stabilisation of aquifer conditions. Groundwater sampling was conducted on the 21 September 2023.

All groundwater wells were gauged prior to sampling. The standing water levels were measured from the top of the well casing (TOC) using an interface probe (IP).

All monitoring wells were purged and sampled using a low flow sampling technique (peristaltic pump). During purging, field groundwater quality parameters were collected including pH, redox potential, dissolved oxygen (DO), electrical conductivity (EC) and temperature to ensure stable conditions prior to sample collection.

Groundwater samples were collected into laboratory supplied bottles suitable for PFAS analysis whilst using clean nitrile gloves between sample locations to prevent cross-contamination. The samples were subsequently stored in an esky and were delivered under chilled conditions to the analytical laboratory with accompanying chain of custody documentation. The groundwater gauging and sampling records are provided in Appendix J.

7.4 Groundwater Analytical Program

The laboratories used for the groundwater investigation were Eurofins (primary laboratory) and Envirolab (secondary laboratory). Both laboratories are registered by the National Association of Testing Authorities (NATA) and the analyses conducted were within their NATA registration.

All groundwater samples were subject to PFAS long-suite analyses with a standard limit of reporting (LOR). QA/QC samples (field blanks, rinsate blanks and duplicate pairs) were also analysed as part of quality control protocol.

7.5 Groundwater Investigation Results

7.5.1 Groundwater Levels and Inferred Groundwater Flow

Groundwater levels in the wells were gauged from the marked point on the well casing on the 28 September 2023 using an electronic interface water level meter during the groundwater monitoring events. The groundwater gauging sheets are attached in Appendix J. Groundwater levels are presented in Table 7.2.

Table 7.2 Relative Groundwater Levels (to AHD)

Well ID	Surveyed top of casing (m AHD)	Surveyed Ground Level (m AHD)	Depth to Groundwater (m bTOC)	Relative groundwater level (m AHD)
MW01	2.975	3.079	2.530	0.445
MW02	2.962	3.061	2.450	0.512
MW03	2.995	3.075	2.550	0.445

The groundwater gauging results were used to interpolate a groundwater contour map depicted on Figure 4 at the end of the report. Groundwater was expected to flow in a north to north-east direction towards the Port Pirie Creek

and Spencer Gulf, however based on the contours, the groundwater has been inferred to flow in an easterly direction.

This is not consistent with the expected regional groundwater flow and could be explained due to:

– The location of the site in a low-lying area with tidal influence from the Spencer Gulf (3.2 km north) and Port Pirie Creek (1.3 km north-east).
– The site is located on a shallow sedimentary groundwater basin as reported in GHD 2023a.
– Fill material was observed during logging of the boreholes across the site to a depth of 0.4 m bgl, with fill material noted to a deeper depth of 1.0 m bgl in a northwest - southeast section across the site in boreholes BH04, BH05, MW01 and MW02. This could indicate the location of possible underground infrastructure, including the site stormwater system, which could influence the groundwater flow direction if there is a problem with the stormwater system.
– Where most borelogs noted a sandy silt layer >1 m at a depth of 1.2 m bgl, boreholes MW02 and MW03 noted a thinner sandy silt layer approximately 10 - 20 cm thick at the same depth.
– No heavy rain periods were reported by the Bureau of Meteorology (BoM) during the month of September,
– Groundwater flow at the site could be due to an unknown localised anomaly and be flowing in an easterly direction.

7.5.2 Field Measured Water Quality Parameters

No contamination indicators (such as hydrocarbon presence, chemical odours or sheens) were noted in any of the monitoring wells during the well installation, well development or sampling phases of the investigation.

Groundwater quality parameters were monitored during purging and before sampling. The final values of these parameters prior to sampling are summarised in Table 7.3.

Table 7.3 Field Measured Groundwater Quality Parameters

Well ID	Date Sampled	Temp (°C)	pH	Dissolved oxygen (mg/L)	Oxidation-reduction potential (mV)	Electrical conductivity (µS/cm)
MW01	28/09/2023	22.2	7.01	0.01	-63.4	65,108
MW02	28/09/2023	22.4	7.57	6.89	-83.4	31,484
MW03	28/09/2023	20.3	7.04	-	-68.7	51,070

The above field parameters are indicative of the following:

– The shallow groundwater encountered at the site is neutral with pH ranging between 7.01 and 7.57.
– The groundwater is saline with electrical conductivity values ranging between 31,484 and 65,108 µS/cm.

7.5.3 Analytical Results

A summary of exceedances to the adopted groundwater criteria is tabulated in Table 7.4. A figure showing exceedances with respect to each borehole location is presented in Figure 5 at the end of the report. Detailed analytical groundwater results are provided in Appendix G. The laboratory certificates of analysis are contained in Appendix F.

Table 7.4 Summary of Groundwater Exceedances Against Adopted Criteria

Location	Date	PFHxS (µg/L)	PFOS (µg/L)	PFOA (µg/L)	Sum of PFOS PFHxS (µg/L)
MW01	28/09/2023	160	240	7.2	400
MW02	28/09/2023	17	17	0.74	34
MW03	28/09/2023	37	30	1.7	67

Notes:
Green depicts exceedances of the PFAS NEMP 2.0 2020 Recreational Water criteria.
Yellow depicts exceedances of the PFAS NEMP 2.0 2020 Health Drinking Water criteria.

8. Quality Assurance and Quality Control

A detailed Quality Assurance and Control (QA/QC) assessment was completed for all analytical sample data, in order to determine whether it is of suitable quality on which to base the site assessment. This included the collection and review of inter- and intra-laboratory duplicates and rinsate blank samples.

The QA/QC assessment found that the majority GHD QA/QC Data Quality Indicators (DQIs) were within the specified requirements. Some PFAS compounds noted relative percentage differences (RPD) exceedances, however this is likely due to the low concentrations of PFAS compounds detected in the samples. The data is, therefore considered to be valid and of sufficient quality to rely on for the purpose and objectives of this assessment. A copy of the detailed QA/QC report is provided in Appendix K.

9. Conceptual Site Model

Fundamental to any contamination investigation is the development of a CSM, which is a description of the plausible mechanisms ('pathway'), by which people and ecology ('receptors') may be exposed to chemicals in the environment ('sources'). Potential risks to human health or the environment cannot occur unless there is a complete Source-Pathway-Receptor (SPR) linkage. Conversely, complete SPR linkages do not by default indicate a risk and the site investigation process is used to evaluate the extent of potential risks.

Based on the potential source-pathway-receptor (SPR) linkages identified in the preliminary site investigation (GHD 2023a), and additional information gleaned during this investigation, the CSM developed for the site has been refined and is summarised in Table 9.1.

SPR linkages were assessed under the following categories:

– Unknown – Not enough data available to indicate if a linkage is present or absent.
– Possible – Data indicates PFAS impacts, or a potential source has been identified, and receptors are present, however source extent and/or pathways to a receptor are not understood.
– Likely – PFAS impact has been confirmed and pathways to receptors are likely present, however extent of the connection has not been confirmed or is not fully understood.
– Confirmed – PFAS impact greater than the adopted assessment criteria are shown to present at the receptor, hence SPR linkage has been confirmed present.
– Unlikely – Source and/or pathways have not been identified or have been identified below the assessment criteria protective of the receptor, hence SPR linkage is unlikely complete.

Visual representation of the CSM is shown in Figures 6 and 7 at the end of the report.

Table 9.1 CSM for PFAS Exposure - SPR Linkage Assessment

Source	Potential Receptors	Exposure Pathways	Risk from exposure through SPR Linkages
On-site PFAS impacted soils	Site users, visitors, maintenance, and construction workers	Direct dermal contact with contaminated soil Incidental ingestion of contaminated soil Inhalation of contaminated soil or dust from disturbed soils	**Possible** Results of soil sampling indicated an absence of criteria exceedances for a commercial land use. One surface sample reported concentrations above the Tier 1 HIL B for a residential land use with minimal soil accessibility. It is noted that the location of the HIL B criteria exceedance (SS04) is in an area unlikely to be frequently accessed by site occupants/workers. The potential exposure risk to site users and visitors, maintenance or construction workers would to PFAS in quantities detrimental to their health during normal site occupation is considered low. Notwithstanding, given the vertical and lateral extent of PFAS impacts in soils across the site has not been delineated, the potential presence of PFAS at higher concentrations within shallow soil can't be ruled out. This suggests mitigating controls such as an environmental management plan may be required to manage potential exposure during excavation/maintenance works carried out on-site.
	Ecosystem at, and immediately surrounding, the site	Direct contact with contaminated soil Ingestion of contaminated soil Bioaccumulation through indirect contact	**Likely** PFAS concentrations were detected in nearly all borehole and surface soil samples obtained, with many exceeding the adopted Tier 1 interim ecological criteria for indirect exposure. The unsealed areas of the site are accessible to flora and fauna, with native fruit trees observed along the northern and western boundaries of the site. 100m north-east of the site lies the Phoenix Park of unknown ecological value. Further work in the form of ecological risk assessment may be required to assess potential impacts to identified receptors via the identified pathways.
	Groundwater beneath the site	Rainwater / surface runoff leaching impacted soil followed by migration through porous media into groundwater	**Confirmed** Review of groundwater results indicates it is likely that PFAS is leaching from contaminated on-site soils and into the groundwater beneath the site. This is due to the presence of shallow groundwater with PFAS concentrations above the screening criteria.

Source	Potential Receptors	Exposure Pathways	Risk from exposure through SPR Linkages
On-site PFAS impacted concrete and bitumen surfaces	Site users, visitors, maintenance, and construction workers	Direct dermal contact with contaminated concrete or bitumen Inhalation of contaminated dust	**Possible** Concrete and bitumen surfaces on-site that have historically been exposed to PFAS containing AFFF during training activities; however, samples collected during the field work have not been tested for PFAS. Notwithstanding, the potential exposure risk to site users, visitors, maintenance, and/or construction workers to PFAS in quantities detrimental to their health is considered low.
	Groundwater beneath the site	Rainwater / surface runoff leaching impacted soil followed by migration through porous media into groundwater	**Possible** Concrete and bitumen surfaces on-site that have historically been exposed to PFAS containing AFFF during training activities have not been tested for PFAS. The potential of PFAS leaching from contaminated concrete or bitumen on-site into the groundwater has not been tested yet.
Off-site PFAS impacted soils	Off-site users of the area inclusive of the general public, maintenance and subsurface construction workers	Direct dermal contact with contaminated soil Incidental ingestion of contaminated soil Inhalation of contaminated soil or dust from disturbed soils	**Possible** A surface soil sample collected along the western boundary (SS04) recorded PFOS concentrations above the adopted Tier 1 HIL B for residential with minimal opportunity for soil access. Surrounding off-site land uses are predominantly commercial/industrial, except for land to the west which is low density residential (HIL A). Further work may be required to confirm potential impacts to off-site receptors because of the shallow PFAS contamination in soil.
	Ecosystem surrounding the site	Direct dermal contact with contaminated soil Incidental ingestion of contaminated soil Bioaccumulation through indirect contact	**Likely** On-site PFAS concentrations exceeded the Tier 1 Ecological indirect exposure criteria in 19 soil samples including 8 of the surface soil samples that were collected around the boundary of the site. Two soil samples also exceeded the Tier 1 Ecological direct exposure criteria. Based on the location of the surface samples, it is likely that PFAS concentrations in soil extend off-site. 100m north-east of the site lie the Phoenix Park Wetlands of unknown ecological value. Further work in the form of ecological risk assessment may be required to assess potential impacts to identified receptors via the identified pathways.
	Groundwater beneath impacted soil	Rainwater/surface runoff leaching impacted soil followed by migration through porous media into groundwater	**Likely** The potential of PFAS leaching from contaminated soil into the groundwater is likely given that PFAS concentrations were detected in nearly all borehole and surface soil samples collected as part of this investigation. PFAS concentrations were also detected in all on-site groundwater samples. Further work is required to confirm the presence/absence of off-site PFAS contamination in groundwater as a result of identified soil impacts.

Source	Potential Receptors	Exposure Pathways	Risk from exposure through SPR Linkages
PFAS-impacted groundwater	People using groundwater for: domestic and drinking purposes	Rainwater/surface runoff leaching impacted soil followed by migration through porous media into groundwater	**Unlikely** Review of TDS data for on-site wells and other wells within the 2.0 km radius from the site indicate concentrations ranged between 2,827 mg/L and 103,020 mg/L. The high salinity precludes the use of groundwater for drinking, domestic and irrigation purposes. The potential exposure risk was therefore considered likely to be low.
	People using groundwater for irrigation of edible vegetation which they grow for consumption	Consumption of edible vegetation irrigated by contaminated groundwater	
	People growing edible vegetation in open soil which may interact with groundwater, resulting the bioaccumulation of PFAS	Consumption of PFAS impacted edible vegetation	**Possible** GHD staff reported 8 fruiting Quandong trees located along the northern and western boundary of the site, which were accessible to site occupants and the public. The presence of PFAS impacts in groundwater has been confirmed and residential properties with gardens where edible vegetation could be grown are present within 2.0 km of the site. The potential concentration of PFAS within Quandong fruit is unknown and so is the ability of this vegetation to utilise salty groundwater. Further work would be required to assess/analyse the concentration and therefore understand the potential exposure risk to site occupants and the public.
	People using groundwater for recreational purposes such as filling of swimming pools	Direct dermal contact or incidental ingestion of contaminated groundwater	**Unlikely** No wells were identified for recreational use within 2km of the site. However, some wells were listed for an “unknown” purpose which means that recreational use of groundwater cannot be ruled out. Nevertheless, due to the variable and highly saline nature of groundwater in the area and the availability of a reticulated mains water supply the potential exposure risk is considered low.
	Down gradient off-site maintenance and sub-surface construction workers that contact PFAS contaminated groundwater	Direct dermal contact or incidental ingestion of contaminated groundwater	**Unlikely** Whilst it is possible that off-site maintenance or sub-surface construction workers could incidentally ingest contaminated groundwater, it is unlikely that they will ingest quantities detrimental to their health.
	Marine ecosystems downstream from the site	Migration and discharge of contaminated groundwater into marine ecosystems	**Possible** The distance from the site to the nearest marine ecosystem (Port Pirie River/Estuary) is approximately 1.3 km from the site and concentrations that may present a risk are unlikely to migrate this distance. Further work is required to confirm the presence/absence of off-site PFAS contamination in groundwater with respect to the potential exposure risk to down gradient marine ecosystems.

Source	Potential Receptors	Exposure Pathways	Risk from exposure through SPR Linkages
	Livestock watering, aquaculture or human consumption of aquatic foods	Abstraction of groundwater	**Unlikely** No registered agricultural wells or activities are within close proximity to the site however unknown well purposes mean that agricultural use of groundwater cannot be precluded. Notwithstanding, given the highly saline nature of groundwater in the general area, the potential for groundwater abstraction to occur for this purpose was considered to be low, and therefore the exposure risk was likely to be negligible.
PFAS impacted surface waters (off-site) as a result of PFAS contaminated groundwater discharging to the environment or contaminated surface water runoff emanating from the site	People using surface waters for recreational activities (swimming)	Incidental ingestion of contaminated groundwater	**Unknown** The potential for PFAS impacts in surface water down gradient of the site has not been determined. Potential pathways with respect to bioaccumulation of PFAS in fish and other marine animals and subsequent consumption by people are not understood. Further work is required to confirm the presence/absence of PFAS impacts in groundwater off-site and downgradient of the site, and potential interaction with a receiving environment. Based on the current dataset, potential exposure risks are considered likely to be low.
	People Fishing from surface waters	Consumption of PFAS contaminated biota	
	Marine ecosystems downstream from the site	Discharge of PFAS impacted surface water into the marine environment	**Possible** The potential for PFAS impacts in surface water down gradient of the site has not been determined however it is considered possible given the training using AFFF that was undertaken at the site and surface water runoff being discharged to a local storm water retention wetland that then discharges to the Port Pirie Creek.

10. Discussion

10.1 Soil Results Summary

PFOS was the predominant PFAS compound identified and was reported in samples collected from the surface, near surface and at depth. Of the 31 samples analysed (including field duplicates) PFOS was detected in 29 samples and criteria exceedances were reported in 12 samples. Detectable concentrations ranged between 0.0082 mg/kg to 5.6 mg/kg. The maximum depth to which PFOS was detected was at 3.5 m bgl at location MW03.

The widespread detections of PFOS at the site and across a wide depth profile is indicative of the highly dispersive nature of PFAS. PFOS detections in soil samples taken along the site boundary likely correlate to direct and indirect transport mechanisms such as over spraying during firefighting training exercises and surface run-off associated with flushing activities. Due to exceedances detected along the property boundary but not off-site testing undertaken, PFAS contamination was unable to be fully laterally or vertically delineated during the investigation work. Further investigations are likely required to assess potential impact extent and associated risks to human health and the environment, including off-site.

The PFAS NEMP (2020) HIL B human health-based investigation levels for soil and site-specific HILs for the screening of PFAS contaminated soils at MFS sites (Metropolitan, Staffed) are used to assess potential human exposure to PFAS contaminated soils in line with the applicable soil accessibility. The HIL B investigation level assumes no potential use of soil for consumption of home-grown produce, such as dwellings with fully paved yard spaces. Site-specific Health Investigation Levels (SSHILs) have been derived using exposure assumptions that reflect the typical usage pattern of the MFS fire stations, to allow for tailored assessment of the potential exposure risks that may be associated with the presence of PFAS in shallow soils (GHD 2023c).

An exceedance on human health HIL B assessment criteria was reported in surface soil sample SS04 for both PFOS (5.6 mg/kg) and sum of PFHxS and PFOS (5.83 mg/kg). No exceedances were reported with respect to the SSHILs developed for MFS sites. Potential risks to current site users and visitors is therefore considered to be low.

However, the presence of widespread and variable levels of PFAS in soils across the site suggests concentrations could be higher in parts of the site that were not able to be assessed (noting that PFAS was not able to be delineated during the investigation). As such, potential mitigation measures in the form of an environmental management plan may be required to minimise potential exposure to construction and maintenance workers during any work requiring interaction with shallow soils (such as excavation work).

The PFAS NEMP 2.0 (2020) direct and indirect ecological exposure risk values for PFOS are protective of organisms that are in direct contact with soil (i.e., plants and worms) and secondary consumers (i.e., birds, small mammals, and reptiles), respectively. We note the PFAS NEMP (2020) indirect ecological exposure value of 0.01 mg/kg is a default value derived for all land use scenarios. However, the PFAS NEMP (2020) also states that this guideline value may be over-protective and site-specific characteristics may justify the use of a higher value (0.14 mg/kg), for example in scenarios where a site is located within an extensively built-up urban. For the purpose of this assessment GHD has adopted the indirect ecological exposure criteria of 0.14 mg/kg.

The analytical results of the soil samples have shown PFOS concentrations exceeding the direct ecological exposure criteria (1 mg/kg) at two locations and the indirect ecological exposure criteria (0.14 mg/kg) at each soil sampling location investigated. The potential risk of exposure to ecologically significant receptors therefore can’t be ruled out and further work is likely required to assess potential risks and impacts to the environment.

10.2 Groundwater Summary

Groundwater assessment was facilitated through the drilling and construction of three monitoring wells at the site. The groundwater flow direction was to the east and exhibited a flat gradient due to the topographic profile of the site surface and consistently shallow depth to groundwater (approximately 2.5 m bgl). It is likely that minor

changes in the depth to groundwater could change the inferred direction of groundwater flow if additional monitoring is undertaken. Groundwater salinity was measured to be very high, ranging between 31,484 µs/cm and 65,108 µs/cm (which is about 22,000 mg/L to 45,000 mg/L TDS using a conversion factor of 0.7).

PFAS contamination in the form of PFOS, PFHxS, and PFOA was reported above the adopted screening criteria for both human health and the environment in all three monitoring wells installed at the site. Given the shallow depth of groundwater, it is likely that the PFAS contamination in groundwater is a result of identified PFAS impacts in soil.

Potential exposure risks associated with direct abstraction and consumption of groundwater (either for drinking or recreational purposes) was considered unlikely due to the salinity characteristics of groundwater at and in the general area of the site. Therefore, and with respect to the CSM, potential receptors considered to be potentially impacted are associated with:

– Any potential groundwater discharge environments which may exist down hydraulic gradient of the site (i.e. to the north and/or east).
– Any edible vegetation which may be interacting with groundwater (notably, very salty groundwater) resulting in potential consumption of PFAS a result of bioaccumulation.

Additional work would need to be undertaken to confirm the presence/absence of off-site PFAS contamination in groundwater which may be attributable to the site with respect to the potential exposure risk to edible vegetation, groundwater dependant ecosystems and any down gradient groundwater receiving environments. Should it be assessed that site derived PFAS impacts are likely to be discharging to the environment then further work may also be needed to assess bioaccumulation potential of PFAS in fish and other marine animals.

11. Conclusions and Recommendations

Based on the results of this investigation the following conclusions have been made:

- The lithologies encountered beneath the site during this investigation are consistent with the regional geology, with sand and sandy clay identified below the fill material.
- Shallow groundwater was encountered between 2.45 - 2.55 m bgl.
- Reported PFAS impacts to soil are likely due to the historical fire-fighting activities undertaken such as flushing of vehicles and equipment in the wash down area and storage of PFAS.
- Regarding reported soil results:
  - The highest reported concentrations of PFAS in soils have been identified within the historical training area beneath the concrete apron.
  - An exceedance on human health HIL B assessment criteria was reported in a surface soil sample (SS04) along the western boundary of the site.
  - A total of 25 samples were taken within the 17 sampling sites strategically distributed within the historical training site, wash down area and along the southern and western site boundaries. Out of this, six samples have yielded concentration values exceeding the standard values for indirect ecological exposure and three samples yielded concentration values exceeding the indirect ecological exposure-developed sites
  - Concentration of PFOS was recovered from samples at all depths. The maximum depth to which PFOS concentration was still detected was 3.5 m bgl.
  - The elevated concentrations of PFOS on surface to near surface depths signifies the shallow depth concentration and highly dispersive nature of PFAS.
  - Delineation of the vertical and lateral extent and degree of PFAS impacts are subject to further investigation.
  - Potentially complete SPR linkages were identified with respect to the presence of widespread ecological criteria exceedances. The potential risk of exposure to ecologically significant receptors therefore can't be ruled out and further work is likely required to assess potential risks and impacts to the environment.
  - Potential mitigation measures in the form of an environmental management plan may be required to minimise potential soil exposure to construction and maintenance workers during any work requiring interaction with shallow soils (such as excavation work).
- Regarding reported groundwater results:
  - Groundwater was encountered at relatively shallow depths (approximately 2.5 m bgl) and was measured to be very saline based on review of field measured electrical conductivity.
  - Groundwater flow was in an easterly direction during the sampling event. Changes in inferred flow direction should be assessed with respect to the low and relatively flat hydraulic gradient at the site. The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not yet been confirmed and thoroughly delineated.
  - PFAS contamination in the form of PFOS, PFHxS, and PFOA was reported above the adopted screening criteria for both human health and the environment in all three monitoring wells installed at the site.
  - Potential exposure risks associated with direct abstraction and consumption of groundwater (either for drinking or recreational purposes) was considered unlikely due to the salinity characteristics of groundwater at and in the general area of the site.
  - Additional work would need to be undertaken to confirm the presence/absence of off-site PFAS contamination in groundwater which may be attributable to the site with respect to the potential exposure risk to edible vegetation, groundwater dependant ecosystems and any down gradient groundwater receiving environments. Should it be assessed that site derived PFAS impacts are likely to be discharging to the environment then further work may also be needed to assess bioaccumulation potential of PFAS in fish and other marine animals.

The following recommendations have been made:

– Further intrusive assessment works to delineate the nature and spatial extent of the contamination in soil and groundwater off-site in all directions.
– A secondary GME, including both on-site and off-site groundwater wells, to confirm groundwater flow direction.
– Sealing of the unpaved areas along the site boundary where most of the samples reported high PFAS concentrations.
– Biota sampling and potential removal of indigenous species *Santalum acuminatum* (Quandong) observed along the northern and western property boundaries which is accessible to the public.
– Conduct a groundwater-use survey within the vicinity of the site to evaluate the potential exposure risk attributable to the possible use of groundwater for currently unidentified domestic/recreational purposes.

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Figures

GREY TERRACE

GREY TERRACE

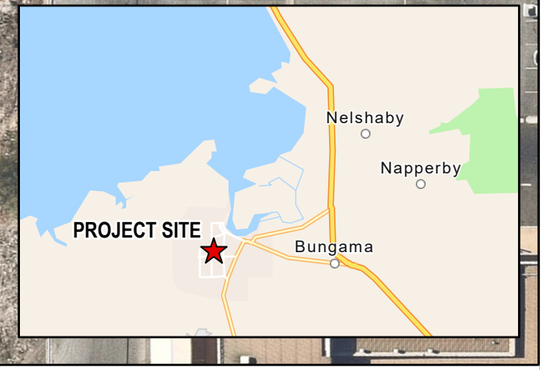
KEEP CLEAR

KEEP CLEAR

SHORT STREET

Legend

- Roads
- AFFF Storage
- Historical Training Area
- Wash Down Bay
- Fuel & Oil Storage
- Site Boundary
- Cadastre



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Map Projection: Transverse Mercator
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Grid: GDA 2020 MGA Zone 54

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South Australian Metropolitan Fire Service
Port Pirie DSI

Project No. **12616807**
Revision No. **A**
Date **31/10/2023**

Port Pirie MFS Site Location Plan

FIGURE 1

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Data source: GHD: Site Boundary (2022); DPTI: Cadastre, Roads (2015). Nearmap WMS: Imagery (Imagery Date Extracted: 12/10/2023). Created by: ejuan

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South Australian Metropolitan Fire Service
Port Pirie DSI

Port Pirie MFS Soil and Groundwater Bore Locations

Project No. **12616807**
Revision No. **B**
Date **11/12/2023**

FIGURE 2

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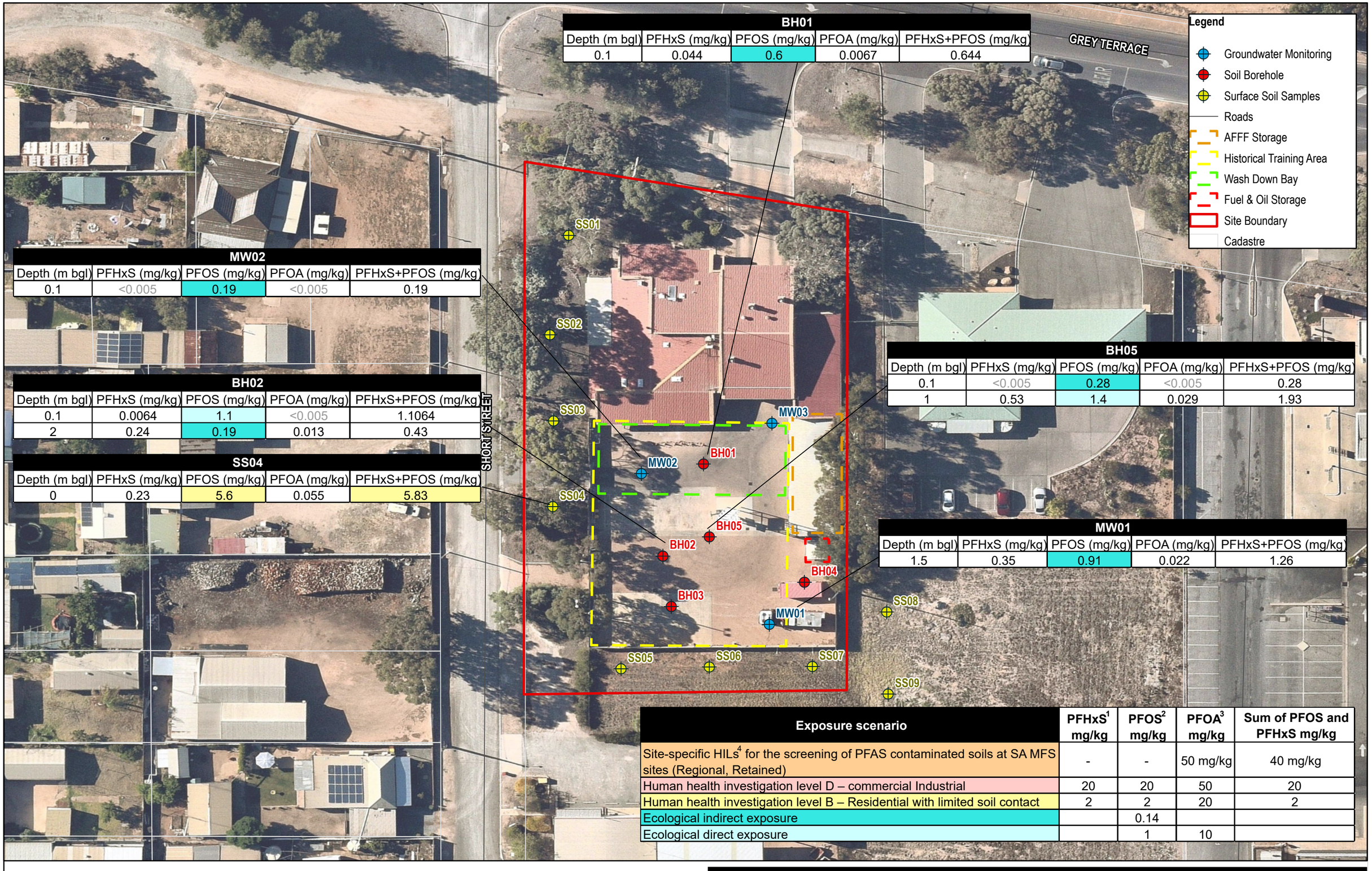

BH01

Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFOA (mg/kg)	PFHxS+PFOS (mg/kg)
0.1	0.044	0.6	0.0067	0.644

MW02

Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFOA (mg/kg)	PFHxS+PFOS (mg/kg)
0.1	<0.005	0.19	<0.005	0.19

BH02

Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFOA (mg/kg)	PFHxS+PFOS (mg/kg)
0.1	0.0064	1.1	<0.005	1.1064
2	0.24	0.19	0.013	0.43

SS04

Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFOA (mg/kg)	PFHxS+PFOS (mg/kg)
0	0.23	5.6	0.055	5.83

BH05

Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFOA (mg/kg)	PFHxS+PFOS (mg/kg)
0.1	<0.005	0.28	<0.005	0.28
1	0.53	1.4	0.029	1.93

MW01

Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFOA (mg/kg)	PFHxS+PFOS (mg/kg)
1.5	0.35	0.91	0.022	1.26

Legend

- Groundwater Monitoring
- Soil Borehole
- Surface Soil Samples
- Roads
- AFFF Storage
- Historical Training Area
- Wash Down Bay
- Fuel & Oil Storage
- Site Boundary
- Cadastre

Exposure scenario	PFHxS[1] mg/kg	PFOS[2] mg/kg	PFOA[3] mg/kg	Sum of PFOS and PFHxS mg/kg
Site-specific HILs[4] for the screening of PFAS contaminated soils at SA MFS sites (Regional, Retained)	-	-	50 mg/kg	40 mg/kg
Human health investigation level D – commercial Industrial	20	20	50	20
Human health investigation level B – Residential with limited soil contact	2	2	20	2
Ecological indirect exposure		0.14		
Ecological direct exposure		1	10	

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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GHD

South Australian Metropolitan Fire Service
Port Pirie DSI

Port Pirie MFS Soil Exceedances of Adopted Criteria

Project No. **12616807**
Revision No. **B**
Date **19/12/2023**

FIGURE 3

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 53

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GHD

South Australian Metropolitan Fire Service
Port Pirie DSI

Port Pirie MFS
Groundwater Contour Map

Project No. **12616807**
Revision No. **B**
Date **21/12/2023**

FIGURE 4

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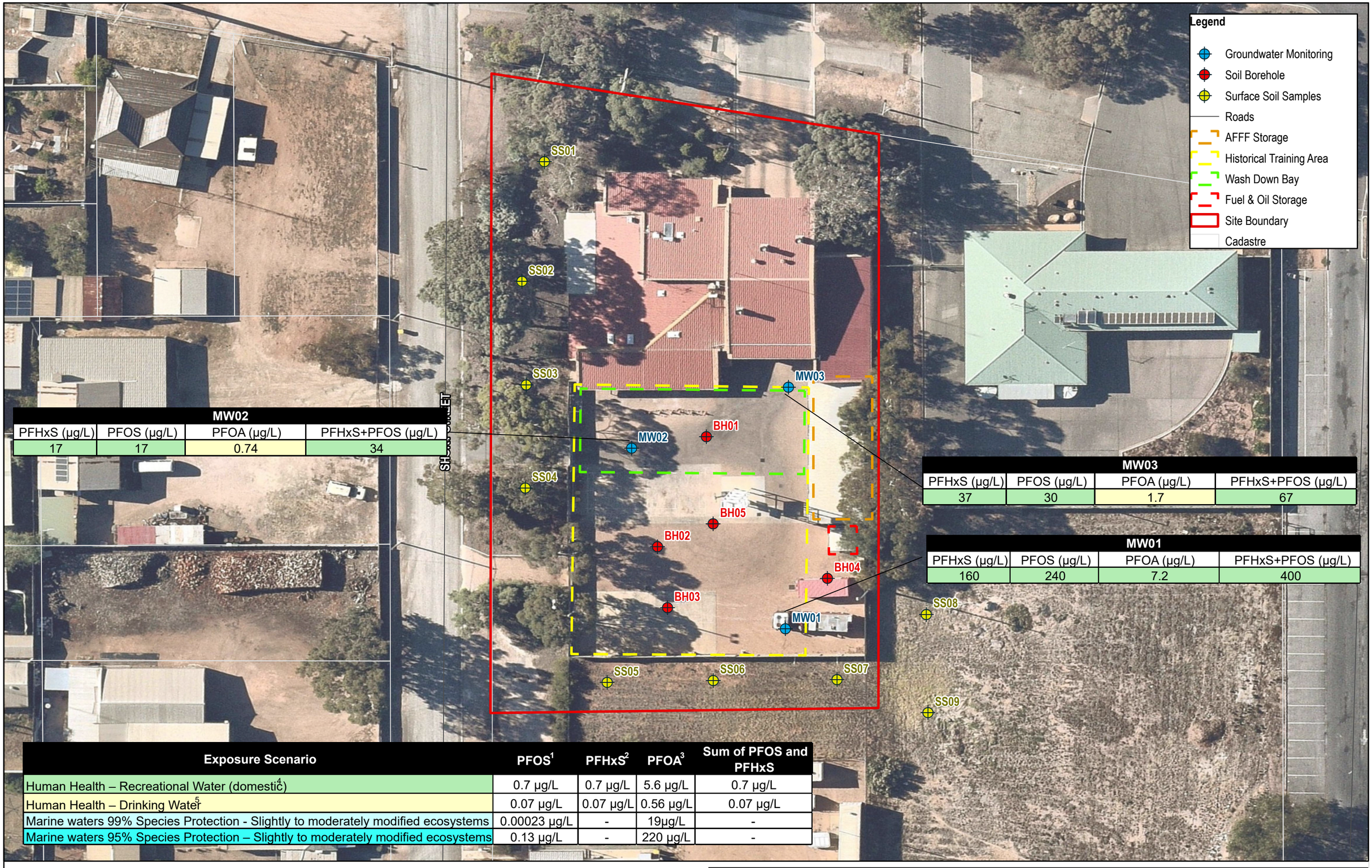

MW02			
PFHxS (µg/L)	PFOS (µg/L)	PFOA (µg/L)	PFHxS+PFOS (µg/L)
17	17	0.74	34

MW03			
PFHxS (µg/L)	PFOS (µg/L)	PFOA (µg/L)	PFHxS+PFOS (µg/L)
37	30	1.7	67

MW01			
PFHxS (µg/L)	PFOS (µg/L)	PFOA (µg/L)	PFHxS+PFOS (µg/L)
160	240	7.2	400

Exposure Scenario	PFOS[1]	PFHxS[2]	PFOA[3]	Sum of PFOS and PFHxS
Human Health – Recreational Water (domestic)[4]	0.7 µg/L	0.7 µg/L	5.6 µg/L	0.7 µg/L
Human Health – Drinking Water[5]	0.07 µg/L	0.07 µg/L	0.56 µg/L	0.07 µg/L
Marine waters 99% Species Protection - Slightly to moderately modified ecosystems	0.00023 µg/L	-	19µg/L	-
Marine waters 95% Species Protection – Slightly to moderately modified ecosystems	0.13 µg/L	-	220 µg/L	-

Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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GHD

South Australian Metropolitan Fire Service
Port Pirie DSI

Port Pirie MFS Groundwater Exceedances of Adopted Criteria

Project No. **12616807**
Revision No. **B**
Date **19/12/2023**

FIGURE 5

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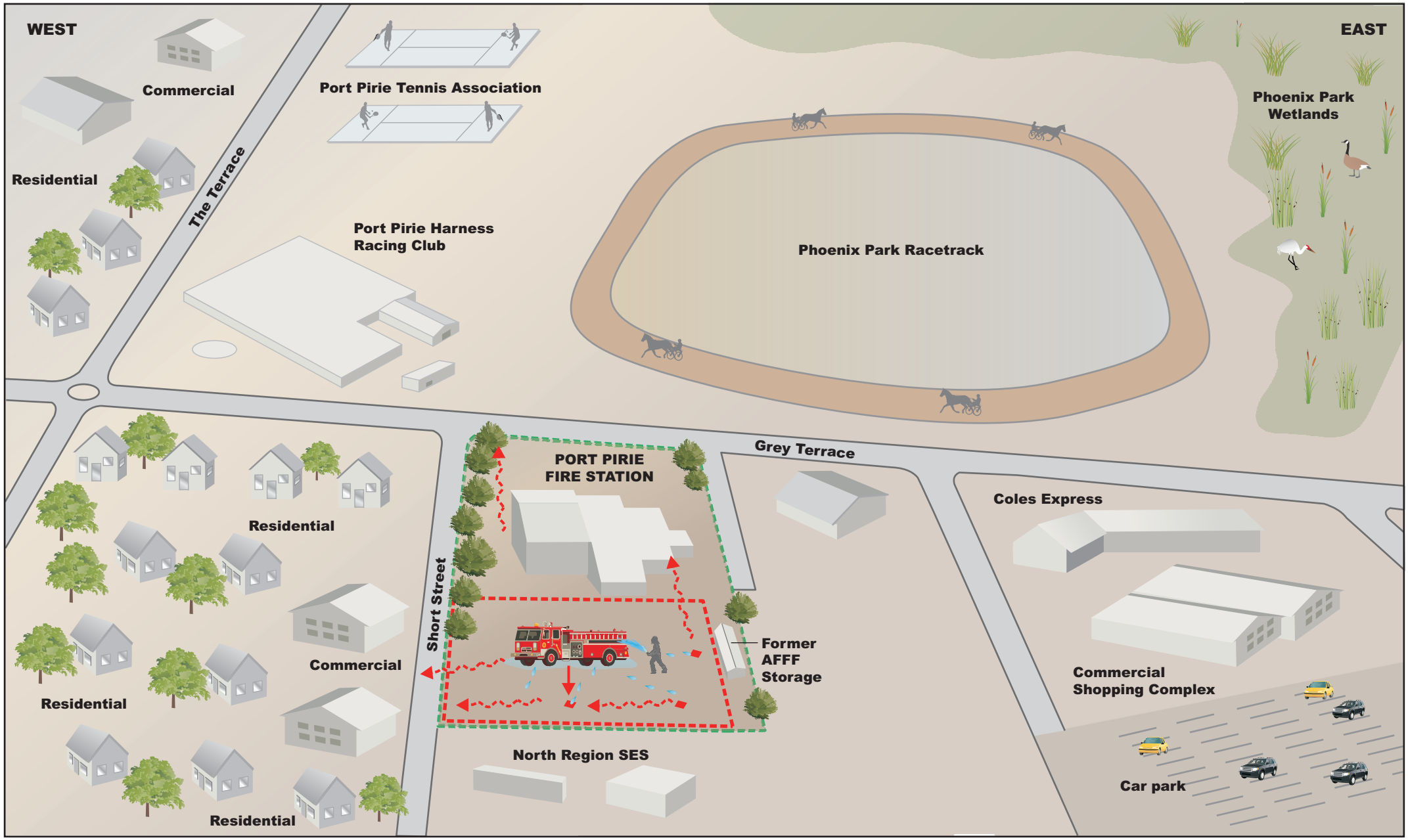


LEGEND

- Site boundary
- Historical training and washdown bay
- PFAS migrating vertically to groundwater
- Stormwater drain
- Discharge of PFAS run-off to stormwater drains

Conceptual diagram only - not to scale

GHD

SA MFS
Port Adelaide DSI
97 Grey Terrace, Port Pirie, SA 5540

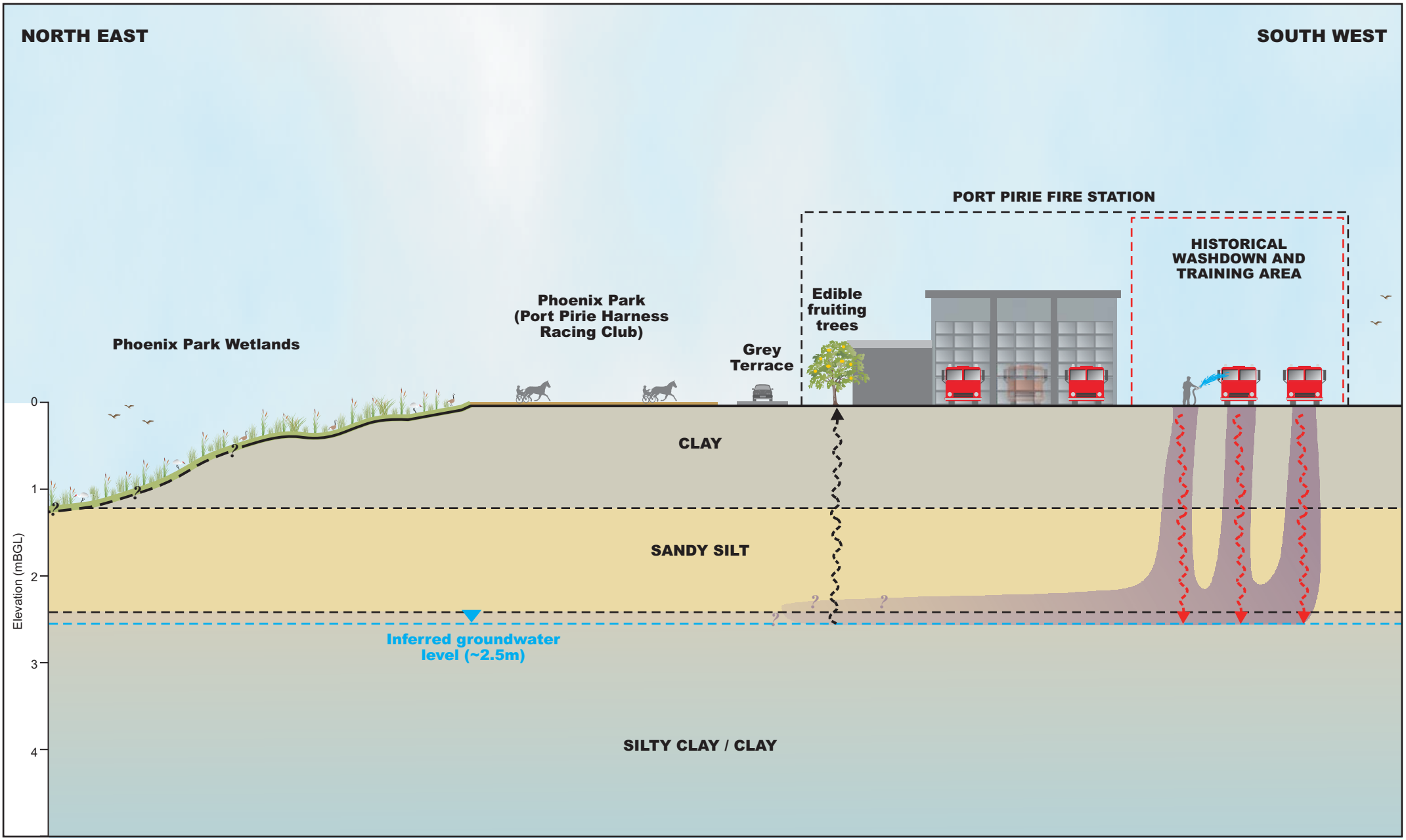
Conceptual site model cross section

Project No. 12616807
Revision No. A
Date 19/12/2023

FIGURE 6

AU\Launceston\Projects\Admin\Graphics\12\616807\12616807_LST_01.cdr

Level 4, 211 Victoria Square Adelaide SA 5000 T 61 8 8111 6600 F 61 8 8111 6699 E ademail@ghd.com W www.ghd.com



LEGEND

- PFAS biotic uptake
- PFAS infiltrati
- Inferred PFAS

Conceptual diagram only - scale is approximate

GHD

SA MFS
Port Adelaide DSI
97 Grey Terrace, Port Pirie, SA 5540

Conceptual site model cross section

Project No. 12616807
Revision No. A
Date 19/12/2023

FIGURE 7

AU\Launceston\Projects\Admin\Graphics\12\616807\12616807_LST_02.cdr

Level 4, 211 Victoria Square Adelaide SA 5000 T 61 8 8111 6600 F 61 8 8111 6699 E ademail@ghd.com W www.ghd.com

Appendices

Appendix A

SA EPA Letter GENI 62917

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
T (08) 8204 2004
Country areas 1800 623 445

EPA GENI 62917

Krystle Mitchell
Senior Scientific and Environmental Officer
South Australian Metropolitan Fire Service
By Email: Krystle.Mitchell@eso.sa.gov.au

Dear Ms Mitchell,

RE: REVIEW OF SITE CONTAMINATION REPORT – ACTION REQUIRED

Site: Various Metropolitan Fire Service (MFS) Fire Stations, South Australia

Thank you for providing the Environment Protection Authority (EPA) with a copy of the following report:

- *MFS 17 Fire Stations PFAS Risk Profiling*, prepared by GHD and dated 26 October 2022.

The above report documents a desktop risk profiling and prioritisation assessment completed for 17 MFS stations previously identified as containing PFAS contamination, based on limited site sampling completed in 2019 (GHD 2019)[1].

The EPA requests that you submit a plan of proposed works and associated timelines to address the highest risk sites by **30 June 2023**.

If you agree to undertake the above listed works it is requested that you submit written acknowledgement to the EPA stating as such. If you wish to discuss potential alterations to the recommended works or delivery date please contact the EPA as soon as possible.

It is not clear in the above report whether stations where no soil sampling was completed, or where the limited sampling showed no site contamination, were considered as part of the risk screening assessment. The EPA notes that the sampling documented in GHD (2019) was highly limited and may not capture all potential PFAS source areas at a station. The EPA recommends that these stations be risk profiled if not undertaken previously.

Please provide a copy of this letter to your engaged consultant to assist them in developing a scope of works for the relevant sites. Fact sheets relating to your obligations under the *Environment Protection Act 1993* and how to engage a site contamination consultant be found at www.epa.sa.gov.au. If you would like further assistance on this matter please contact Brooke Ryan on (08) 8204 8525 or at brooke.ryan2@sa.gov.au.

Yours sincerely

HCustance
Hannah Custance

PRINCIPAL ADVISER, SITE CONTAMINATION

ENVIRONMENT PROTECTION AUTHORITY

Date: 1 February 2023

Cc: Ben Petticrew, Technical/Project Director – Contamination Assessment and Remediation, GHD (ben.petticrew@ghd.com)

[1] *MFS State Wide Appliance and Station Sampling*, prepared by GHD and dated May 2019.

Appendix B

Photolog

Appendix B – Photo Log

Description	Photograph
Photo 1: Drillcore from BH01	

Description	Photograph
Photo 2: Drillcore from BH02	
Photo 3: Drillcore from BH03	

Description	Photograph
Photo 4: Drillcore from BH04	
Photo 5: Drillcore from BH05	

Description	Photograph
Photo 6: Drillcore from MW01	
Photo 7: Drillcore from MW02	

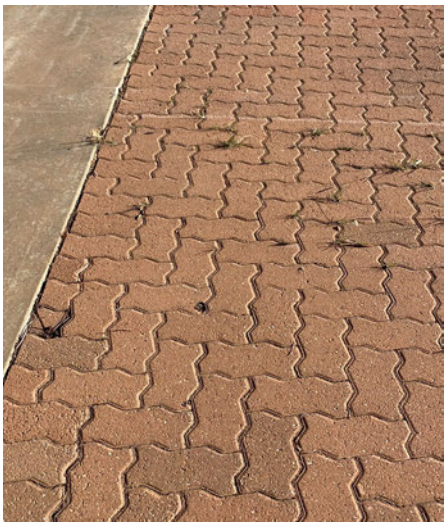
Description	Photograph
Photo 8: Drillcore from MW03	
Photo 9: Quongdong trees along the northern and western boundaries, accessible to the public	 

Description	Photograph
	 

Site Details

Site Name	Port Pirie
Site Address	97 Grey Terrace, Port Pirie South, SA 5540
Inspection Date	March 9, 2023 10:06 AM
Inspector (GHD)	[redacted]

Photograph Log

ID	Description	Photograph
1	**Northing:** 6,323,623 **Easting:** 220,813 **Facing:** E **Description:** Shed on eastern boundary - possibly used for AFFF storage	
2	**Northing:** 6,323,620 **Easting:** 220,807 **Facing:** NE **Description:** Overview of rear yard used for training and appliance wash down	
3	**Northing:** 6,323,612 **Easting:** 220,803 **Facing:** **Description:** Paving in rear yard	

ID	Description	Photograph
4	**Northing:** 6,323,612 **Easting:** 220,793 **Facing:** NE **Description:** Rear yard view from SW corner	
5	**Northing:** 6,323,639 **Easting:** 220,809 **Facing:** NE **Description:** Foam storage area under car Port, likely used for AFFF	
6	**Northing:** 6,323,692 **Easting:** 220,814 **Facing:** S **Description:** Engine room - flat, water pools	

ID	Description	Photograph
7	**Northing:** 6,323,684 **Easting:** 220,808 **Facing:** S **Description:** View of station from front	
8	**Northing:** 6,323,665 **Easting:** 220,804 **Facing:** **Description:** Foam currently used	
9	**Northing:** 6,323,626 **Easting:** 220,789 **Facing:** **Description:** Mop cleaning area, likely to sewage	

ID	Description	Photograph
10	**Northing:** 6,323,637 **Easting:** 220,801 **Facing:** W **Description:** Open ground from leaking pipe 6 months ago	
11	**Northing:** 6,323,634 **Easting:** 220,800 **Facing:** NE **Description:** Engine room	
12	**Northing:** 6,324,064 **Easting:** 221,046 **Facing:** **Description:** Stormwater Pond north of site	

ID	Description	Photograph
13	**Northing:** 6,324,064 **Easting:** 221,056 **Facing:** SE **Description:** Stormwater pond / wetlands north of site	

Appendix C

MFS Surveys

MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF *(aqueous film-forming foam, firefighting foam)* occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Pirie SAMFS Fire Station
Name: [redacted]
Position when working at the site: S/F
Phone number: [redacted] **Email:** [redacted]
Date of response: 26-6-2022

Item	Question	Response
1	*When did you start working at this station?*	1999
2	*How long have you worked at this station?*	22 YEARS
3	*Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?*	STORM WATER POND IN THE TROTTING TRACK
4	*Can you describe any changes in how stormwater has been managed at the site over time?*	NO CHANGE
5	*Is stormwater harvested within the site?*	NO
5.1	*If yes, please describe where and how stormwater is harvested.*	—
5.2	*For what purposes is stormwater harvested?*	—
6	*Are there groundwater wells / bores at the site?*	NO
6.1	*If yes, for what purpose is groundwater used at the site?*	—

Item	Question	Response
6.2	*Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.*	N/A
7	*Date when AFFF was first used on site?*	I BELIEVE PRIOR TO 1999
8	*Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)*	UNKNOWN OLD FOAM FROM MYRSTAL USED FOR TRAINING PURPOSES (IN RED 20L DRUMS) 3M
9	*Was AFFF used in regular training exercises?* *If so:*	NO
9.1	*How often was the training?* *(e.g. weekly, monthly, quarterly)*	QUARTERLY OR LESS
9.2	*Can you describe the location of the training areas and annotate them on the site plan?*	REAR TRAINING AREA
9.3	*Can provide an estimate of how much AFFF was used in each training?*	LESS THAN 20 LITRES USUALLY USED WATER TO EVACUATE IA LEFT
9.4	*Was the training ground sealed / open?*	PAVED OPEN YARD DRAINS TO STORM WATER SYSTEM
9.5	*Was AFFF dispersed aerially?* *If so, please indicate the maximum extent on the site plan?*	USED FROM A 6P PUMP SOUTH / WEST PORTION OF REAR YARD
9.6	*When was the date of the last training event that included the use of AFFF?*	DONT KNOW
10	*Please describe how the waste water was managed following training events?* *Specifically, was there a recycling system, storage pond, storage tanks or drains?* NO *Please annotate waste water discharge point / pathways on the site plan.*	FLUSHED INTO STORM WATER SYSTEM
11	*Did any waste water flow into drains that directed the waste water off-site?* YES *Please annotate the waste water discharge points / pathways on the site plan.*	
12	*Were there any changes how the waste water was managed over time?* *If so, please describe the changes.*	NO
13	*Is there any inventory of AFFF use for the site?*	NO

Item	Question	Response
14	*Can you estimate the total volume of AFFF used on site before it was phased out in 2016?*	I DONT THINK IT WAS MUCH. LESS THAN 120 L
15	*Where was AFFF stored on site?* *Please annotate the storage location on the site plan.*	UNDER SHED 1 WHERE PROPOSED PPE STORAGE IS GOING TO GO
15.1	*What type and size of storage containers were used to store AFFF on site?*	PLASTIC 20L DRUMS PLASTIC 200L DRUMS
15.2	*What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?*	2 x 200L 20 x 20L
16	*Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances.* *What equipment was used to transfer the AFFF?*	MANUALLY PUMPED FROM DRUMS TO PUMP TANK PLASTIC HAND PUMP
17	*How were spent drums of AFFF disposed of?*	RETURNED TO STORE
18	*Were there any wash down areas for fire trucks, equipment or AFFF containers?* *If so:*	NO JUST USED THE REAR YARD
18.1	*How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)*	DISCHARGED TO STORM WATER SYSTEM
18.2	*Were there any changes how the waste water was managed over?* *If so, please describe the changes.*	NO
19	*Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.*	FUEL + OIL EXPANDOL BUSHMASTER BFFF TARDOL SOLBERG
20	*Is there an incident log / register for the site?*	NO

Item	Question	Response
21	*Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:*	NO
21.1	*When did such release(s) happen?*	—
21.2	*What substance(s) was/were released?*	—
21.3	*Where did such release(s) happen?* *Please annotate the release point(s) on the site plan.*	—
21.4	*Where was the released AFFF or chemical discharged to?* *Please annotate the discharge point(s) on the site plan.*	—
22	*Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?*	—
23	*Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?*	TRAINING TOWER REFURBISHED PLUMBING REPAIRS TO REAR YARD
24	*Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.*	DO NOT STORE AFFF ANY MORE

Any other comments or notes.

MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF *(aqueous film-forming foam, firefighting foam)* occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Pirie SAMFS Fire Station
Name: [redacted]
Position when working at the site: S/F
Phone number: [redacted] **Email:** [redacted]
Date of response: 20/6/2022.

Item	Question	Response
1	*When did you start working at this station?*	DEC. 2011.
2	*How long have you worked at this station?*	10½ YEARS.
3	*Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?*	STORMWATER TO LOCAL POND
4	*Can you describe any changes in how stormwater has been managed at the site over time?*	NO
5	*Is stormwater harvested within the site?*	NO
5.1	*If yes, please describe where and how stormwater is harvested.*	—
5.2	*For what purposes is stormwater harvested?*	—
6	*Are there groundwater wells / bores at the site?*	NO
6.1	*If yes, for what purpose is groundwater used at the site?*	—

Item	Question	Response
6.2	*Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.*	—
7	*Date when AFFF was first used on site?*	BEFORE 1999
8	*Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)*	3M / TRIDOL
9	*Was AFFF used in regular training exercises?* *If so:*	NO
9.1	*How often was the training? (e.g. weekly, monthly, quarterly)*	QUARTERLY
9.2	*Can you describe the location of the training areas and annotate them on the site plan?*	REAR YARD
9.3	*Can provide an estimate of how much AFFF was used in each training?*	VERY LITTLE
9.4	*Was the training ground sealed / open?*	PAVED
9.5	*Was AFFF dispersed aerially?* *If so, please indicate the maximum extent on the site plan?*	NO
9.6	*When was the date of the last training event that included the use of AFFF?*	
10	*Please describe how the waste water was managed following training events?* *Specifically, was there a recycling system, storage pond, storage tanks or drains?* *Please annotate waste water discharge point / pathways on the site plan.*	DOWN DRAINS TO STORMWATER.
11	*Did any waste water flow into drains that directed the waste water off-site?* *Please annotate the waste water discharge points / pathways on the site plan.*	YES
12	*Were there any changes how the waste water was managed over time?* *If so, please describe the changes.*	NO
13	*Is there any inventory of AFFF use for the site?*	NO

Item	Question	Response
14	*Can you estimate the total volume of AFFF used on site before it was phased out in 2016?*	610 LT
15	*Where was AFFF stored on site?* *Please annotate the storage location on the site plan.*	✓
15.1	*What type and size of storage containers were used to store AFFF on site?*	205 LT BLUE PLASTIC DRUMS 20 LT PLASTIC DRUMS.
15.2	*What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?*	2 × 205 LT 20 × 20 LT
16	*Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances.* *What equipment was used to transfer the AFFF?*	HAND PUMP FROM 205 LT DRUM TO TRUCK MANUALLY TIP 20LT DRUMS TO TRUCK.
17	*How were spent drums of AFFF disposed of?*	SENT BACK TO STORES.
18	*Were there any wash down areas for fire trucks, equipment or AFFF containers?* *If so:*	REAR YARD
18.1	*How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)*	DOWN THE DRAIN
18.2	*Were there any changes how the waste water was managed over?* *If so, please describe the changes.*	NO
19	*Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.*	20LT UNLEADED FUEL 20 LT TWO STOKE FUEL. FOR PUMPS & EQUIPMENT TOOLS ON TRUCKS
20	*Is there an incident log / register for the site?*	NONE.

Item	Question	Response
21	*Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:*	NO
21.1	*When did such release(s) happen?*	—
21.2	*What substance(s) was/were released?*	—
21.3	*Where did such release(s) happen?* *Please annotate the release point(s) on the site plan.*	—
21.4	*Where was the released AFFF or chemical discharged to?* *Please annotate the discharge point(s) on the site plan.*	—
22	*Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?*	NO
23	*Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?*	NO
24	*Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.*	NONE

Any other comments or notes.

Appendix D

Borehole Logs

BOREHOLE LOG

ENVIRONMENTAL-EXTRACTION WELL

MONITORING WELL BH01

Client Eurpocar
Project Europcar HIAPL RAP Implementation
Project No. 12586185
Site Port Pirie Fire Station
Location 97 Grey Terrace
Date Drilled 20/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 4.00
Diameter (mm) 50

Easting, Northing 780192.0906, 6323615.671
Grid Ref GDA2020_MGA_zone_54
Elevation
TOC mAHD
Logged By AK
Checked By TD

B.C.L No. N/A **Casing** **Screen** **Surface Completion** Backfill

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA						CONCRETE			No odour; No staining	0
0.2			BH01_0.1				Gravelly SAND fine to medium, poorly graded, pale grey- brown (FILL)	D	L	No odour; No staining	-0.2
0.4	PT						CLAY low to medium plasticity, fine to medium, mottled grey- brown, some (NATURAL - SOIL)	SM	ST	No odour; No staining	-0.4
0.6			BH01_0.5								-0.6
0.8							Sandy CLAY low to medium plasticity, brown with mottled grey, some (NATURAL - SOIL)	M	ST	No odour; No staining	-0.8
1			BH01_1.0				Clayey SAND fine to medium, poorly graded, mottled grey- brown with mottled orange- brown, fine to medium, poorly graded sand (NATURAL - SOIL)	M	MD	No odour; No staining	-1
1.2											-1.2
1.4											-1.4
1.6			BH01_1.5								-1.6
1.8							Sandy SILT fine to medium, poorly graded, mottled brown- grey, fine to medium, poorly graded gravel (NATURAL - SOIL)	M	MD	No odour; No staining	-1.8
2			BH01_2.0								-2
2.2											-2.2
2.4											-2.4
2.6			BH01_2.5								-2.6
2.8							Sandy CLAY low plasticity, grey- brown, fine to medium, poorly graded sand (NATURAL - SOIL)	SM	MD	No odour; No staining	-2.8
3			BH01_3.0				CLAY low plasticity, brown (NATURAL - SOIL)	M	F	No odour; No staining	-3
3.2											-3.2
3.4											-3.4
3.6			BH01_3.5 (FD01, FS01)								-3.6
3.8											-3.8
4			BH01_4.0								-4
4.2							Termination Depth at: 4.00 m. Target depth achieved.				-4.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-EXTRACTION WELL

MONITORING WELL BH02

Client Eurpocar
Project Europcar HIAPL RAP Implementation
Project No. 12586185
Site Port Pirie Fire Station
Location 97 Grey Terrace
Date Drilled 20/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 4.00
Diameter (mm) 50

Easting, Northing 780185.801, 6323600.144
Grid Ref GDA2020_MGA_zone_54
Elevation
TOC mAHD
Logged By AK
Checked By TD

B.C.L No. N/A **Casing** **Screen** **Surface Completion** Backfill

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA						CONCRETE			No odour; No staining	
0.2			BH02_0.1				Gravelly SAND fine to medium, poorly graded, pale grey- brown (FILL)	D	L	No odour; No staining	-0.2
0.4											-0.4
0.6			BH02_0.5				SAND fine to medium, poorly graded, brown with mottled grey, some fine to medium gravel (NATURAL - SOIL)	D	MD	No odour; No staining	-0.6
0.8							Silty CLAY low to medium plasticity, brown with mottled grey, some (NATURAL - SOIL)	M	ST	No odour; No staining	-0.8
1	PT		BH02_1.0								-1
1.2							Silty SAND fine to medium, poorly graded, mottled grey- brown (NATURAL - SOIL)	M	MD	No odour; No staining	-1.2
1.4											-1.4
1.6			BH02_1.5								-1.6
1.8											-1.8
2			BH02_2.0				Sandy SILT mottled brown- grey (NATURAL - SOIL)	M	MD	No odour; No staining	-2
2.2											-2.2
2.4				▽			SILT grey with mottled brown, some fine sand (NATURAL - SOIL)	M	MD	No odour; No staining	-2.4
2.6			BH02_2.5								-2.6
2.8							Silty CLAY low plasticity, brown, trace fine sand (NATURAL - SOIL)	M	MD	No odour; No staining	-2.8
3			BH02_3.0								-3
3.2											-3.2
3.4											-3.4
3.6			BH02_3.5								-3.6
3.8							CLAY low plasticity, brown, with fine to medium sand (NATURAL - SOIL)	M	ST	No odour; No staining	-3.8
4			BH02_4.0				Termination Depth at: 4.00 m. Target depth achieved.				-4
4.2											-4.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-EXTRACTION WELL

MONITORING WELL BH03

Client Eurpocar
Project Europcar HIAPL RAP Implementation
Project No. 12586185
Site Port Pirie Fire Station
Location 97 Grey Terrace
Date Drilled 20/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 4.00
Diameter (mm) 50

Easting, Northing 780186.7464, 6323591.468
Grid Ref GDA2020_MGA_zone_54
Elevation
TOC mAHD
Logged By AK
Checked By TD

B.C.L No. N/A **Casing** **Screen** **Surface Completion** Backfill

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA						CONCRETE			No odour; No staining	
0.2			BH03_0.1				Gravelly SAND fine to medium, poorly graded, pale grey- brown (FILL)	D	L	No odour; No staining	-0.2
0.4							SAND fine to medium, poorly graded, orange- brown with mottled grey, some fine to medium gravel (NATURAL - SOIL)	D	MD	No odour; No staining	-0.4
0.6			BH03_0.5								-0.6
0.8							Silty CLAY low to medium plasticity, brown with mottled grey (NATURAL - SOIL)	M		No odour; No staining	-0.8
1	PT		BH03_1.0				Silty SAND fine to medium, poorly graded, mottled grey- brown (NATURAL - SOIL)	M	MD	No odour; No staining	-1
1.2							Sandy SILT mottled brown- grey (NATURAL - SOIL)	M	MD	No odour; No staining	-1.2
1.4											-1.4
1.6			BH03_1.5								-1.6
1.8											-1.8
2			BH03_2.0				SILT grey with mottled brown, some fine sand (NATURAL - SOIL)	M	MD	No odour; No staining	-2
2.2											-2.2
2.4				▽							-2.4
2.6			BH03_2.5 (FD04, FD04)				Silty CLAY low plasticity, fine, well graded, dark grey- brown, trace fine sand (NATURAL - SOIL)	M	MD	No odour; No staining	-2.6
2.8											-2.8
3			BH03_3.0								-3
3.2											-3.2
3.4							CLAY low to medium plasticity, fine, poorly graded, brown, with fine to medium sand (NATURAL - SOIL)	M	ST	No odour; No staining	-3.4
3.6			BH03_3.5								-3.6
3.8											-3.8
4			BH03_4.0				Termination Depth at: 4.00 m. Target depth achieved.				-4
4.2											-4.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-EXTRACTION WELL

MONITORING WELL BH04

Client Eurpocar
Project Europcar HIAPL RAP Implementation
Project No. 12586185
Site Port Pirie Fire Station
Location 97 Grey Terrace
Date Drilled 20/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 4.00
Diameter (mm) 50

Easting, Northing 780206.0043, 6323595.079
Grid Ref GDA2020_MGA_zone_54
Elevation
TOC mAHD
Logged By AK
Checked By TD

B.C.L No. N/A **Casing** **Screen** **Surface Completion** Backfill

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA						CONCRETE			No odour; No staining	
0.2			BH04_0.1				Sandy GRAVEL fine to coarse, poorly graded, pale brown- grey (FILL)	D	L	No odour; No staining	-0.2
0.4	PT										-0.4
0.6			BH04_0.5				SAND well graded, orange- brown, some medium gravel (FILL)	D	L	No odour; No staining	-0.6
0.8											-0.8
1			BH04_1.0				CLAY medium plasticity, fine to medium, grey- brown, some fine to medium sand (NATURAL - SOIL)	M	ST	No odour; No staining	-1
1.2											-1.2
1.4							Sandy SILT fine to medium, poorly graded, mottled grey- yellow (NATURAL - SOIL)	M	MD	No odour; No staining	-1.4
1.6			BH04_1.5								-1.6
1.8											-1.8
2			BH04_2.0								-2
2.2											-2.2
2.4							Silty CLAY low plasticity, fine to medium, grey- brown, some fine sand (NATURAL - SOIL)	M		No odour; No staining	-2.4
2.6			BH04_2.5								-2.6
2.8											-2.8
3			BH04_3.0								-3
3.2											-3.2
3.4							CLAY low plasticity, brown (NATURAL - SOIL)	M	F	No odour; No staining	-3.4
3.6			BH04_3.5								-3.6
3.8											-3.8
4			BH04_4.0 (FD03, FD03)								-4
4.2							Termination Depth at: 4.00 m. Target depth achieved.				-4.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-EXTRACTION WELL

MONITORING WELL BH05

Client Eurpocar
Project Europcar HIAPL RAP Implementation
Project No. 12586185
Site Port Pirie Fire Station
Location 97 Grey Terrace
Date Drilled 20/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 4.00
Diameter (mm) 50

Easting, Northing 780192.5538, 6323603.208
Grid Ref GDA2020_MGA_zone_54
Elevation
TOC mAHD
Logged By AK
Checked By TD

B.C.L No. N/A **Casing** **Screen** **Surface Completion** Backfill

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA						CONCRETE			No odour; No staining	0
0.2			BH05_0.1				Gravelly SAND fine to medium, poorly graded, pale grey- brown (FILL)	D	L	No odour; No staining	-0.2
0.4	PT										-0.4
0.6			BH05_0.5								-0.6
0.8											-0.8
1			BH05_1.0 (FD02, FS02)				Silty SAND low to medium plasticity, fine to medium, brown with mottled grey, some (NATURAL - SOIL)	M	MD	No odour; No staining	-1
1.2											-1.2
1.4							Sandy SILT fine to medium, mottled grey-yellow (NATURAL - SOIL)	M	MD	No odour; No staining	-1.4
1.6			BH05_1.5								-1.6
1.8											-1.8
2			BH05_2.0				Silty SAND fine to medium, mottled yellow- grey (NATURAL - SOIL)	M	MD	No odour; No staining	-2
2.2											-2.2
2.4											-2.4
2.6			BH05_2.5								-2.6
2.8							Sandy CLAY low plasticity, fine to medium, poorly graded, grey- brown (NATURAL - SOIL)	M	MD	No odour; No staining	-2.8
3			BH05_3.0								-3
3.2							CLAY low plasticity, brown (NATURAL - SOIL)	M	F	No odour; No staining	-3.2
3.4											-3.4
3.6			BH05_3.5								-3.6
3.8											-3.8
4			BH05_4.0								-4
4.2							Termination Depth at: 4.00 m. Target depth achieved.				-4.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW01

Client SA Metropolitan Fire Station
Project MFS Port Pirie DSI
Project No. 12616807
Site Port Pirie Fire Station
Location 97 Grey Terrace
Date Drilled 21/09/2023 - 21/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Drill Method
Total Depth (m) 4.00
Casing Diameter (mm) 50

Latitude -33.190325784807
Longitude 138.00541364279
Grid Ref GDA2020_MGA_zone_54
Elevation 3.079
Logged By AK
Checked By TD

B.C.L No. 448399 **Casing** 50 mm PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA						CONCRETE			No odour; No staining	3
0.2			MW01_0.1		Concrete		Sandy GRAVEL fine to coarse, poorly graded, pale brown- grey (FILL)	D	L	No odour; No staining	2.8
0.4	PT										
0.6			MW01_0.5				SAND well graded, orange- brown, some medium gravel (FILL)	D	L	No odour; No staining	2.6
0.8											2.4
1			MW01_1.0				CLAY medium plasticity, fine to medium, grey- brown, some fine to medium sand (NATURAL - SOIL)	M	ST	No odour; No staining	2.2
1.2											2
1.4							Silty SAND fine to medium, mottled grey-yellow (NATURAL - SOIL)	M	MD	No odour; No staining	1.8
1.6			MW01_1.5 (FD06, FS06)								1.6
1.8											1.4
2			MW01_2.0								1.2
2.2					Sand						1
2.4											0.8
2.6			MW01_2.5				Silty CLAY low plasticity, fine to medium, grey- brown, some fine sand (NATURAL - SOIL)	W	MD	No odour; No staining	0.6
2.8											0.4
3			MW01_3.0								0.2
3.2											0
3.4							CLAY low plasticity, brown (NATURAL - SOIL)	M	F	No odour; No staining	-0.2
3.6			MW01_3.5								-0.4
3.8											-0.6
4			MW01_4.0								-0.8
4.2							Termination Depth at: 4.00 m. Target depth achieved.				-1
											-1.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW02

Client SA Metropolitan Fire Station
Project MFS Port Pirie DSI
Project No. 12616807
Site Port Pirie Fire Station
Location 97 Grey Terrace
Date Drilled 21/09/2023 - 21/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Drill Method
Total Depth (m) 4.00
Casing Diameter (mm) 50

Latitude -33.1900940428707
Longitude 138.005216381511
Grid Ref GDA2020_MGA_zone_54
Elevation 3.061
Logged By AK
Checked By TD

B.C.L No. 4483400 **Casing** 50 mm PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA						CONCRETE			No odour; No staining	3
0.2			MW02_0.1		Concrete		Gravelly SAND fine to coarse, poorly graded, pale brown- grey (FILL)	D	L	No odour; No staining	2.8
0.4	PT										2.6
0.6			MW02_0.5								2.4
0.8											2.2
1			MW02_1.0				CLAY medium plasticity, fine to medium, poorly graded, brown, some fine to medium sand, some fine to medium gravel (NATURAL - SOIL)	M	ST	No odour; No staining	2
1.2							SAND fine to medium, poorly graded, orange- brown, some silt (NATURAL - SOIL)	SM	MD	No odour; No staining	1.8
1.4							Silty CLAY medium plasticity, fine to medium, mottled grey- yellow, trace fine to medium sand (NATURAL - SOIL)	M	MD	No odour; No staining	1.6
1.6			MW02_1.5								1.4
1.8											1.2
2			MW02_2.0								1
2.2					Sand						0.8
2.4											0.6
2.6			MW02_2.5				Silty CLAY low plasticity, fine to medium, poorly graded, brown, some fine sand (NATURAL - SOIL)	W	MD	No odour; No staining	0.4
2.8											0.2
3			MW02_3.0								0
3.2											-0.2
3.4							CLAY low to medium plasticity, brown (NATURAL - SOIL)	M	F	No odour; No staining	-0.4
3.6			MW02_3.5								-0.6
3.8											-0.8
4			MW02_4.0				Termination Depth at: 4.00 m. Target depth achieved.				-1
4.2											-1.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW03

Client SA Metropolitan Fire Station
Project MFS Port Pirie DSI
Project No. 12616807
Site Port Pirie Fire Station
Location 97 Grey Terrace
Date Drilled 21/09/2023 - 21/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Drill Method
Total Depth (m) 4.00
Casing Diameter (mm) 50

Latitude -33.1900158155916
Longitude 138.00541768119
Grid Ref GDA2020_MGA_zone_54
Elevation 3.075
Logged By AK
Checked By TD

B.C.L No. 4483401 **Casing** 50 mm PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA						CONCRETE			No odour; No staining	3
0.2			MW03_0.1		Concrete		Sandy GRAVEL medium to coarse, poorly graded, pale brown (FILL)	D	L	No odour; No staining	2.8
0.4	PT										2.6
0.5			MW03_0.5				CLAY medium plasticity, fine to medium, poorly graded, brown, some fine to medium sand, some fine to medium gravel (NATURAL - SOIL)	M	ST	No odour; No staining	2.4
0.8											2.2
1			MW03_1.0								2
1.2							SAND fine to medium, poorly graded, orange- brown, some silt (NATURAL - SOIL)	SM	MD	No odour; No staining	1.8
1.4							Silty CLAY medium plasticity, fine to medium, mottled grey- yellow, trace fine to medium sand (NATURAL - SOIL)	M	MD	No odour; No staining	1.6
1.6			MW03_1.5								1.4
1.8											1.2
2			MW03_2.0 (FD07, FS07)								1
2.2					Sand						0.8
2.4											0.6
2.5			MW03_2.5								0.4
2.8							Silty CLAY low plasticity, fine to medium, poorly graded, brown, some fine sand (NATURAL - SOIL)	W	MD	No odour; No staining	0.2
3			MW03_3.0								0
3.2											-0.2
3.4							CLAY low to medium plasticity, brown (NATURAL - SOIL)	M	F	No odour; No staining	-0.4
3.5			MW03_3.5								-0.6
3.8											-0.8
4			MW03_4.0				Termination Depth at: 4.00 m. Target depth achieved.				-1
4.2											-1.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

Appendix E

SSHIL Methodology

Crown Tower, Level 11, 200 Crown Street
Wollongong, New South Wales 2500
Australia
www.ghd.com

Our ref: 12602101

28 June 2023

Krystle Mitchell
Senior Scientific and Environment Officer
South Australian Metropolitan Fire Service
99 Wakefield Street
Adelaide, SA 5000

Derivation of site-specific health investigation levels for urban and regional fire stations – South Australia Metropolitan Fire Service (SA MFS)

Dear Krystle,

1. Introduction

This letter describes the derivation of site-specific health investigation levels (SSHILs) for per- and poly-fluoroalkyl substance (PFAS) contaminated soil at fire stations operated by the South Australia Metropolitan Fire Service (SA MFS). SSHILs have been derived for urban and regional settings based on the methodology provided in the following documents: .

- Heads of EPAs Australia and New Zealand (HEPA) and the Australian Government Department of the Environment and Energy (DoEE) – *PFAS National Environmental Management Plan* (the 'PFAS NEMP') (HEPA, 2020)
- National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC, 2013) (the 'ASC NEPM')
- NSW and Office of Environment and Heritage (OEH, 2019) *Human health soil screening criteria for PFOS, PFHxS and PFOA*

1.1 Background

From 2007, SA MFS began phasing out the use of aqueous film-forming foam (AFFF) containing perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) as key constituents, due to concerns regarding the hazards posed by these compounds to human health and the environment. The SA MFS replaced all firefighting foam in 2016 to ensure that only fluorine-free foam was in use. Currently, state-wide, all SA MFS appliances carry firefighting foams that do not contain PFOS or PFOA and are fluorine-free. During 2017/2018, the SA MFS also removed all fire extinguishers containing PFAS. In 2018, SA MFS engaged GHD to provide ongoing environmental services and undertake site contamination assessments across many of their operational sites as well as risk profiling for their entire portfolio of sites to effectively manage the potential for PFAS contamination and any associated human health and ecological risks.

The PFAS NEMP provides generic health investigation levels (HILs) for PFOS, PFOA and perfluorohexane sulfonate (PFHxS) in soil in four land use settings, as summarised in Table 1 below. The land use settings considered in the PFAS NEMP are consistent with those that underpin the HILs presented for a variety of contaminants within the ASC NEPM. The derivation of the PFAS HIL values is described in detail by OEH (2019).

Table 1 Summary of exposure scenarios adopted to derive generic HILs.

Land use	HIL (mg/kg)	Exposure scenario description
HIL A Residential, with gardens /accessible soil	PFOS+PFHxS: 0.01 PFOA: 0.1	- Low-density residential settings with sizeable gardens and with areas of soil that are accessible - Gardens are assumed to consist of lawns, garden beds and small vegetable gardens and areas of fruit trees - Assumes home-grown produce provides up to 10% of fruit and vegetable intake (does not account for consumption of eggs from home poultry) - Site users are adults, children and infants who spend most of their time at home and use the outdoor areas of the residences on a frequent basis for activities such as gardening or recreation. This scenario assumes 20 hours a day spent indoors and 4 hours a day spent outdoors in direct contact with soil. - Children are the most sensitive human receptors. This scenario is protective of childcare centres, kindergartens, preschools and primary schools and their integral playgrounds.
HIL B Residential, with minimal opportunities for soil access	PFOS+PFHxS: 2 PFOA: 20	- High-density residential settings, such as unit blocks, where communal outdoor spaces are largely covered by permanent paving and with some small areas of landscaping or lawns - Assumes that there are minimal opportunities for direct access to soil by residents. There may be some potential for residents to inhale, ingest or come into direct dermal contact with dust particulates derived from the on-site soil. - Assumes no use of soil to produce vegetables, fruit or poultry - Site users are adults, children and infants who spend most of their time indoors with limited use of communal outdoor areas on site. This scenario assumes 20 hours a day spent indoors and 1 hour a day spent outdoors in direct contact with soil. - Children are the most sensitive human receptors
HIL C Public open space	PFOS+PFHxS: 1 PFOA: 10	- Parks, playgrounds, recreational areas and playing fields that are fully accessible to the public - These areas may contain lawns, gardens, vegetated areas, and walkways with some areas of exposed soil - Assumes no use of soil to produce vegetables, fruit or poultry - Site users are adults and children who may use the area for up to 2 hours a day, 7 days a week - Children are the most sensitive human receptors
HIL D Commercial/ industrial	PFOS+PFHxS: 20 PFOA: 50	- Commercial and/or industrial settings where the outdoor areas are largely (80%) covered by hardstand, possibly with some limited areas of landscaping or lawns - Site users are adult employees that spend up to 8 hours a day indoors and 1 hour a day outdoors for up to 240 days per year - There are minimal opportunities for direct access to soil. There is the potential for employees to inhale, ingest or come into direct contact with dust particulates derived from the soil on the site.

A review of Table 1 indicates that the typical usage patterns at SA MFS fire stations most closely align with the exposure assumptions that underpin the HIL D values. The following inconsistencies are however noted:

– The preliminary site investigations undertaken at SA MFS sites across South Australia has identified that some fire stations have a higher proportion of unsealed ground (up to approximately 75% of the total site area) than has been assumed in the derivation of the HIL D values (up to approximately 20% of the total site area). As a result of this, there may be greater opportunities for direct access to soil at SA MFS fire stations, including the ingestion of soil and soil-derived dust.

– The shifts worked by SA MFS firefighters do not align with the assumption of a standard working week than underpins the HIL D values

Given these factors, SSHILs have been derived using exposure assumptions that reflect the typical usage pattern of the SA MFS fire stations, to allow for a more accurate assessment of the health risks that may be associated with the presence of PFAS in shallow soils.

1.2 Objective of this report

The objective of this report is to derive SSHILs for PFOS+PFHxS and PFOA in soils that are protective of workers at SA MFS fire stations in typical urban and regional settings. The purpose of these SSHILs is to facilitate the screening assessment of soil datasets for human health risks.

2. Derivation methodology

The SSHILs have been calculated using the HILs spreadsheet (Excel format) provided on the ASC NEPM website[1]. The algorithms underlying the HILs spreadsheet are detailed in Schedule B7 of the ASC NEPM. These algorithms were also used in the derivation of the HILs PFOS+PFHxS and PFOA, presented in Table 1 and as detailed by OEH (2019).

The process used to derive the SSHILs involved the following key steps:

- ***Toxicity assessment:*** which established the relationships between PFAS exposure and potential health and ecological effects, using published toxicological information
- ***Exposure assessment:*** which produced estimates of the PFAS exposure that may be experienced by users of SA MFS fire stations.
- ***Risk characterisation:*** which combines the results of the toxicity assessment and exposure assessment, to derive soil criteria that are protective of potential risks to the health of users of SA MFS fire stations.

The toxicity assessment and exposure assessment inputs used in the derivation of the SSHILs are detailed herein, with the SSHILs provided in Section 3.

2.1 Toxicity assessment methodology

A toxicity assessment determines whether human exposure to a chemical could cause an increase in the incidence of an adverse health condition (NEPC, 2013). The outcomes of the toxicity assessment process are a set of toxicity criteria that have been used to derive the SSHILs.

For most chemicals there is a dose below which no adverse health effect will occur (i.e., a threshold toxicant). PFAS have been linked with several threshold toxicities, including effects on cholesterol and immunotoxicity. Accordingly, the SSHILs focus on potential threshold risks linked to PFAS exposure. Chronic health risks for threshold chemicals are assessed by comparing the estimated intake with toxicity reference values (TRVs), which are a measure of tolerable daily exposure. The TRVs adopted in the derivation of the SSHILs are consistent with those that underpin the HIL D values presented in the PFAS NEMP, as detailed in Table 2.

The toxicity assessment process also considers the toxicokinetics of PFAS and in particular the tendency of PFAS to be absorbed via the various potential routes of exposure (i.e., ingestion, inhalation and dermal absorption). Consistent with the approach adopted by OEH (2019) the dermal uptake of PFAS has been assumed to be negligible and has not been included in the derivation of the SSHILs.

[1] **https://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox**

Table 2 Summary of toxicological input parameters used in the derivation of the SSHILs.

Chemical	Toxicity assessment input parameters	Source
Toxicity reference values		
PFOS, PFHxS (sum)	20 ng/kg/day	OEH (2019); FSANZ (2017)
PFOA	160 ng/kg/day	OEH (2019); FSANZ (2017)
Absorption parameters		
Dermal absorption	Negligible	OEH (2019)
Gastrointestinal absorption	100%	OEH (2019); FSANZ (2017)

2.2 Exposure assessment methodology

In an exposure assessment, appropriate exposure assumptions are identified for each exposure pathway, and these are used in conjunction with exposure modelling algorithms to estimate intakes of contaminants by the exposed receptors (NEPC, 2013).

The exposure assessment inputs adopted in the derivation of the SSHILs have primarily been sourced from OEH (2019), with adjustments made as appropriate, based on information provided by SA MFS. A summary of the adopted exposure assessment inputs and the rational underpinning the selected values is provided in Attachment 1. These inputs can be summarised as follows:

- *Firefighter physiology*: The ASC NEPM Schedule B7 provides standard exposure parameters for commercial / industrial scenarios, including factors such as the body weight and inhalation characteristics of adult workers. Consistent with the approach adopted by OEH (2019), these have been adopted in the derivation of SSHILs, as SA MFS firefighters will typically be physiologically consistent with the general population.
- *Exposure frequency and time onsite*: Information provided by SA MFS has been used to select appropriate input assumptions around exposure frequency and time spent onsite, as detailed in Section 2.2.1
- *Exposure to PFAS from external sources*: PFAS is present in a variety of domestic products and commercial applications and is ubiquitous in urban settings. Hence, SA MFS firefighters are likely to be exposed to PFAS from a variety of sources external to the fire stations, such as food, air, water and consumer products. The TRVs detailed in Section 2.1 are relevant to the PFAS intake from all sources. The HIL D presented in the PFAS NEMP were derived based on the conservative assumption that 80% of the exposure to PFAS experienced by workers originates from external sources, with 20% of the TRV allocated to PFAS in fire station soils. This conservative assumption has been retained in the derivation of SSHILs for SA MFS firefighters
- *Incidental soil ingestion rates*: The incidental soil ingestion rates for SA MFS firefighters have been assumed to be consistent with those experienced by adults in a residential setting (50 mg/day), rather than those adopted in the ASC NEPM and by OEH (2019) for commercial/industrial sites (25 mg/day). This approach is likely to be conservative but has been adopted to account for the extended shifts worked by firefighters in metropolitan areas and the substantial areas of unsealed ground that are present on some of the SA MFS fire stations.
- *Use of SA MFS fire stations by children*: Children have not been specifically included in the derivation of the SSHILs. It is understood that children do visit the SA MFS fire stations but that this does not occur with regularity. Hence, the SSHILs, which have been derived to be protective of firefighters employed at the fire stations, will also be adequately protective of the health children visiting less frequently.

– *Produce production and consumption*: Historically, produce gardens were present on a number of the SA MFS fire stations and it is understood that there was some concern that the time spent tending these gardens and consuming produce would be associated with increased levels of exposure to PFAS. In 2022 however, SA MFS issued a directive on advice from GHD and EPA that all fruit and vegetable plants be removed from fire stations and replaced with ornamental plants (refer to Attachment 2). Areas of ornamental landscaping are not inconsistent with the exposure assumptions underpinning the HIL D values and therefore adjustments to the exposure assumptions used to derive the SSHILs have not been made on this basis.

2.2.1 Firefighter shifts

As noted in Table 1, the generic HIL D values assume that workers spend up to 240 days a year at commercial/industrial sites: eight hours a day indoors and one hour a day outdoors. This is equivalent to a total yearly exposure of 2160 hours. Given that the shifts worked by firefighter in both urban and regional areas differ from this pattern, the specific exposure times provided by SA MFS have been adopted in the derivation of the SSHILs as follows:

– Metropolitan fire stations – SA MFS has indicated that firefighters typically work two 10-hour dayshifts and two 14-hours nightshifts followed by four days off work and that firefighters work for 6 months before taking 6 weeks of annual leave. This averages to 12-hour shifts for circa 150 days per year. This is equivalent to a total yearly exposure of 1800 hours, which is lower than the exposure assumption underpinning the generic HIL D values.
– Regional fire stations – SA MFS has indicated that firefighters can spend up to three hours a week at regional fire stations. This is equivalent to a total yearly exposure of 156 hours per year, which is substantially lower than the exposure assumption underpinning the generic HIL D.

3. Site-specific HILs for the screening of PFAS contaminated soils at SA MFS sites

The input parameters selected via the toxicity assessment and exposure assessment processes, as detailed in Sections 2.1 and 2.2 respectively, have been combined to calculate SSHILs for the screening of PFAS contaminated soils at SA MFS fire stations. The models used to calculate the SSHILs are presented in Attachment 3 and Table 3 summarises the derived SSHIL values.

Table 3 SSHILs derived for the screening of PFAS contaminated soil in urban and regional SA MFS fire stations

Fire station type	PFOS+PFHxS	PFOA*	Comment
Metropolitan	14 mg/kg	50 mg/kg	These SSHILs assumes four 12-hour shifts every eight days (i.e., four days at work and four days off)
Regional	40 mg/kg	50 mg/kg	These SSHILs assumes one 3-hour shift per week.
Notes: Although higher values were calculated using the toxicity and exposure assessment process, the SSHIL for PFOA has been set as 50 mg/kg in anticipation of the Stockholm Convention low content limit. This is consistent with the PFAS NEMP			

4. Closure

We trust that the information above is sufficient for SA MFS's purposes. Should you have any further questions on this document please do not hesitate to contact the undersigned.

Regards

Davide Menozzi
Senior Environmental Scientist
davide.menozzi@ghd.com

Ben Petticrew
Technical Director
ben.petticrew@ghd.com

5. References

FSANZ. (2017). *Food Standards Australia New Zealand's (FSANZ) report on Perfluorinated Chemicals in Food.*

HEPA. (2020). *PFAS National Environmental Management Plan - Version 2.0* .

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Amendment Measure* .

OEH. (2019). *Human health soil screening criteria for PFOS, PFHxS and PFOA.*

Attachments

Attachment 1

Summary of exposure assessment inputs

Summary of SA MFS sites - unsealed areas

Location (metro)	Unsealed area (m^2)	Total area (m^2)	% unsealed
Angle park	111254	153034	73%
Adelaide	115	20000	1%
St Marys	1229	4543	27%
Largs	1163	3316	35%
Woodville	141	2172	6%
Christie Downs	710	2321	31%
Camden Park	531	2771	19%
Oakden	1302	4802	27%
Port Adelaide	449	4349	10%
O'Halloran Hill	2959	7300	41%
Brooklyn Park	1090	3710	29%
Beulah Park	335	2791	12%
Elizabeth	100	3256	3%
Gawler	1300	3457	38%
Glen Osmond	180	3152	6%
Golden Grove	1172	3994	29%
Paradise	680	4090	17%
Prospect	580	2820	21%
Salisbury	2442	12607	19%
Seaford	2300	7450	31%
Mount Barker	362	2110	17%
	Unsealed Average	**Total Area Average**	**% average**
	815	4,913	17%
Max	111254	153034	73%
Min	100	2110	1%

Location (regional)	Unsealed area (m^2)	Total area (m^2)	% unsealed
Loxton	987	2154	46%
Moonta	1	920	0%
Whyalla	6224	11054	56%
Mt Gambier	1506	3884	39%
Kapunda	1	395	0%
Peterborough	519	994	52%
Port Pirie	7875	19297	41%
Port Augusta	961	2461	39%
Murray Bridge	796	2005	40%
Berri	583	3065	19%
Kadina	1	577	0%
Port Lincoln	420	6058	7%
Renmark	70	3573	2%
Tanunda	168	1438	12%
Victor Harbor	400	1847	22%
Wallaroo	1032	1600	65%
	Unsealed Average	**Total Area Average**	**% average**
	222	2,276	10%
Max	7875	19297	65%
Min	1	395	0%

Summary of exposure parameters

Summary of Exposure Parameters	units	Parameter			Rationale
		HIL D	SA MFS SSHIL - Urban	SA MFS SSHIL - Regional	
Soil and Dust Ingestion Rate	mg/day	25	50	50	HIL D assumes that the incidential soil ingestion rate experienced by adults working for 8-hours on a commercial industrial site (25 mg/day) is likely to be ~50% of that experienced by adults in a residential setting (50 mg/day), given that waking hours are typically ~16-hours per day. The ASC NEPM residential soil ingestion rate has been adopted for SA MFS firefighters, given that substantial areas of unsealed ground are present on some of the SA MFS fire stations and firefighters may spend significant periods of time outdoors. This assumption is likely to be conservative for firefighters in regional settings, who typically spend less time onsite
Time Spent Outdoors	hours	1	4	2	HIL D assumes a standard 8-hour working day, with minimal time spent outdoors. MFS SA has indicated that: - firefighters in metropolitan locations typically work 12-hour shifts - firefighters in regional locations typically work 3-hour shifts It has also been assumed that firefighters may spend significant amounts of time outdoors, undertaking activities such as training and equipment and facility maintenance
Time Spent Indoors	hours	8	8	1	
Lung Retention Factor	-	0.375	0.375	0.375	ASC NEPM default, as detailed in Schedule B7. Describes the percentage of dust that is small enough to be inhaled.
Particulate Emission Factor	(m^3/kg)	3.70E+10	9.7E+09	9.7E+09	Calculated as described in Schedule B7 of the ASC NEPM. For HIL D, up to 20% of the site is assumed to be open ground. For the SA MFS fire stations up to 75% of the site is assumed to be open ground
Indoor Air Dust Factor	(m^3/kg)	2.6E+07	2.6E+07	2.6E+07	ASC NEPM default, as described in Schedule B7. The indoor dust concentration is assumed to be equal to the 95th percentile from Australian data (enHealth 2012; 39 µg/m^3), noting that indoor air can be enriched with dust compared to the outdoor environment, due to the movement of dust indoors on clothing, footwear etc.
Fraction of indoor dust comprised of outdoor soil	-	0.5	0.5	0.5	ASC NEPM default, as described in Schedule B7. Assume 50% of indoor dust is comprised of soi tracked into the building
Body weight	kg	70	70	70	ASC NEPM default, as described in Schedule B7.
Exposure Frequency	days/year	240	140	52	HIL D assumes a 5-day working week for 48 weeks per year. MFS has indicated that - firefighters in metropolitan stations typically work four shifts every eight days - firefighters in regional stations typically work one 3-hour shift per week
Exposure Duration	years	30	30	30	ASC NEPM default, as described in Schedule B7. Note that this parameter does not influence the derived HIL for threshold chemicals, as exposure is averaged over the exposure duration.
Averaging Time (ingestion)	days	10950	10950	10950	Calculated based on the exposure duration. Multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (inhalation)	hours	262800	262800	262800	

Attachment 2

SA MFS directive on the removal of produce

Government of South Australia

SOUTH AUSTRALIAN METROPOLITAN FIRE SERVICE

MEMORANDUM NO. 77/2022

METROPOLITAN FIRE SERVICE SOUTH AUSTRALIA

29 September 2022

FRUIT AND VEGETABLE GARDEN REMOVAL FROM ALL MFS STATIONS

MFS is directing all MFS stations to remove all fruit and vegetable gardens from MFS stations.

This is required to be completed by the **31st of October 2022**.

Garden waste can be disposed of as per the normal station procedures to dispose of this sort of waste. Where this is not practicable due to volume, please contact your Commander to arrange for an alternative solution, such as the provision of the high sided/skip pod.

If the fruit and vegetable garden cannot be removed by station personnel, please advise via the mfspfas@sa.gov.au. That email is to contain an audit of all fruit/vegetable trees that require removal by external contractors prior to 21 October 2022. The MFS will then arrange for these to be removed.

All fruit and vegetable gardens are required to be removed as the EPA see the presence of fruit and vegetable trees on fire stations as a possible human receptor to PFAS (even if you are not consuming the fruit and vegetables from them).

The MFS will provide ornamental plants and vegetation to replace the plants pulled out up to a value of $100 on application. Applications from each station can be sent to mfspfas@sa.gov.au. Approval will then be forwarded to the relevant Metropolitan/Regional Commander to use their credit card to purchase the goods.

Metropolitan and Regional Commanders are to ensure that there are no fruit and vegetable gardens remaining at their relevant stations after the 31st of October 2022.

C Shift is responsible under the Station Management System - Station Administration, to ensure that this document is read, signed, placed on the Notice Board and filed.

Staff are reminded that the current SAPs, SOPs, Policies, SP Forms, Memorandums, Service Directives and Operational Procedures are available on the Members Only Website (MOW). This is a directive from the Chief Officer.

SIGNED

M. Morgan
CHIEF OFFICER and
CHIEF EXECUTIVE

ACTION	DATE	SIGN
Instruction received at Station		
Instruction read to “A” Shift		
Instruction read to “B” Shift		
Instruction read to “C” Shift		
Instruction read to “D” Shift		
Instruction read to Retained Staff		
Instruction read to OTR		
Placed on Notice Board		
Filed in Station File		

Attachment 3

SSHILs modelling inputs and outputs.

Derivation of Site specific health investigation levels

Firefighters at regional fire stations - South Australian Metropolitan Fire Service

Summary of Exposure Parameters	Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate - Adults	IR_{SA}	mg/day	50	Site-specific assumption: Consistent with assumption adopted for adults in residential settings
Time Spent Outdoors	ETo	hours	1	Site-specific assumption; 3-hour shifts during which 1 hour is spent outdoors.
Time Spent Indoors	ETi	hours	2	Site-specific assumption; 3-hour shifts during which 2 hours are spent indoors.
Lung Retention Factor	RF	-	0.375	ASC NEPM default assumption
Particulate Emission Factor	PEFo	(m^3/kg)	9.7E+09	Calculated: Based on the site-specific assumption that up to 75% of individual sites is open ground
Indoor Air Dust Factor	PEFi	(m^3/kg)	2.6E+07	ASC NEPM default assumption
Fraction of indoor dust comprised of outdoor soil	TF	-	0.5	ASC NEPM default
Body weight - Adults	BW_C	kg	70	ASC NEPM default
Exposure Frequency	EF	days/year	52	Site-specific assumption: One shift per week
Exposure Duration - Adults	ED_C	years	30	ASC NEPM default assumption
Averaging Time (non-carcinogenic)	AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Adult Worker

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Derived Soil HIL (not rounded) (mg/kg)
										Soil Ingestion	Dermal	Dust	
PFOS+PFHxS	0.00002	1	0.00002	100%	-	80%	0.00007	0%		3.9E+01	NA	8.0E+05	39
PFOA	0.00016	1	0.00016	100%	-	80%	0.00056	0%		3.1E+02	NA	6.4E+06	314

NA Pathway not of significance for chemical assessed

Derivation of Site specific health investigation levels

Fire fighters at metropolitan fire stations - South Australian Metropolitan Fire Service

Summary of Exposure Parameters	Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate - Adults	IR_{SA}	mg/day	50	Site-specific assumption: Consistent with assumption adopted for adults in residential settings
Time Spent Outdoors	ETo	hours	4	Site-specific assumption; 12-hour shifts during which 4 hours are spent outdoors.
Time Spent Indoors	ETi	hours	8	Site-specific assumption; 12-hour shifts during which 8 hours are spent indoors.
Lung Retention Factor	RF	-	0.375	ASC NEPM default assumption
Particulate Emission Factor	PEFo	(m^3/kg)	9.7E+09	Calculated: Based on the site-specific assumption that up to 75% of individual sites is open ground
Indoor Air Dust Factor	PEFi	(m^3/kg)	2.6E+07	ASC NEPM default assumption
Fraction of indoor dust comprised of outdoor soil	TF	-	0.5	ASC NEPM default
Body weight - Adults	BW_C	kg	70	ASC NEPM default
Exposure Frequency	EF	days/year	146	Site-specific assumption: Four shifts every eight days (i.e., four days at work and four days off)
Exposure Duration - Adults	ED_C	years	30	ASC NEPM default assumption
Averaging Time (non-carcinogenic)	AT_T	days	ED*365	Calculated based on ED, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Adult Worker

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Derived Soil HIL (not rounded) (mg/kg)
										Soil Ingestion	Dermal	Dust	
PFOS+PFHxS	0.00002	1	0.00002	100%	-	80%	0.00007	0%		1.4E+01	NA	7.2E+04	14
PFOA	0.00016	1	0.00016	100%	-	80%	0.00056	0%		1.1E+02	NA	5.7E+05	112

NA Pathway not of significance for chemical assessed

Appendix F

Laboratory Reports

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address
Level 4 - 211 Victoria Square, Adelaide SA 5000
Telephone: (08) 8111 6600

Completion Date / Turnaround
STANDARD

Quote #
Quote GHD STANDARD RATES

Project Number
12618807

Project Name
MFS Port Pirie DSI

GHD Project Manager
Tom Duncan

GHD Contact
Ally Kirkman

GHD PM email
Tom.Duncan@ghd.com

GHD Contact email
Ally.Kirkman@ghd.com

Laboratory
Eurofins Environmental

Laboratory Address
9 Main Terrace, Richmond SA 5033

Laboratory Contact
Parimal Acharya

COURIER AND LABORATORY INSTRUCTIONS:
- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and EDDAT format.

Sample I.D.	Date and Time	Composite Sample	Sample Media: W: Soil SL: Slurry WW: Wastewater GW: Groundwater	Preservative	Containers: Type J: soil Jar B: bag V: vial G: glass bottle P: plastic bottle	Number	Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO ALS	SAMPLE COMMENTS
BH01_0.1	20-Sep-23		Soil	Ice	J	1		X			
BH01_0.5	20-Sep-23		Soil	Ice	J	1					
BH01_1.0	20-Sep-23		Soil	Ice	J	1			X		
BH01_1.5	20-Sep-23		Soil	Ice	J	1		X	X		
BH01_2.0	20-Sep-23		Soil	Ice	J	1					
BH01_2.5	20-Sep-23		Soil	Ice	J	1			X		
BH01_3.0	20-Sep-23		Soil	Ice	J	1			X		
BH01_3.5	20-Sep-23		Soil	Ice	J	1			X		
BH01_4.0	20-Sep-23		Soil	Ice	J	1			X		
BH02_0.1	20-Sep-23		Soil	Ice	J	1		X			
BH02_0.5	20-Sep-23		Soil	Ice	J	1			X		
BH02_1.0	20-Sep-23		Soil	Ice	J	1			X		
BH02_1.5	20-Sep-23		Soil	Ice	J	1			X		
BH02_2.0	20-Sep-23		Soil	Ice	J	1		X			
BH02_2.5	20-Sep-23		Soil	Ice	J	1			X		
BH02_3.0	20-Sep-23		Soil	Ice	J	1			X		
BH02_3.5	20-Sep-23		Soil	Ice	J	1			X		
BH02_4.0	20-Sep-23		Soil	Ice	J	1			X		
BH03_perver	20-Sep-23		Soil	Ice	J	1			X		
BH03_0.1	20-Sep-23		Soil	Ice	J	1			X		
BH03_0.5	20-Sep-23		Soil	Ice	J	1		X			
BH03_1.0	20-Sep-23		Soil	Ice	J	1			X		
BH03_1.5	20-Sep-23		Soil	Ice	J	1		X			
TOTAL NUMBER OF SAMPLES	111										
TOTAL NUMBER OF ESKIES	1										

CUSTODY DETAILS

SAMPLER

	Date/Time		Date/Time
GHD SERVICE CENTRE		Relinquished by:	
Received by:	Date/Time		
COURIER		Relinquished by:	Date/Time
Received by: Courier:	Date/Time		
LABORATORY		Relinquished by:	Date/Time
Received by Lab:	Date/Time		

#1024418

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address
Level 4 - 211 Victoria Square, Adelaide SA 5000
Telephone: (08) 8111 6600

Completion Date / Turnaround
STANDARD

Quote #
Quote GHD STANDARD RATES

Project Number
12616607

Project Name
MFS Port Pirie DSI

GHD Project Manager
Tom Duncan

GHD Contact
Ally Kirkman

GHD PM email
Tom.Duncan@ghd.com

GHD Contact email
Ally.Kirkman@ghd.com

Laboratory
Eurofins Environmental

Laboratory Address
9 Main Terrace, Richmond SA 5033

Laboratory Contact
Amy Meunier

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludg W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS
BH03_2.0	20-Sep-23		Soil	Ice	J	1			X	
BH03_2.5	20-Sep-23		Soil	Ice	J	1			X	
BH03_3.0	20-Sep-23		Soil	Ice	J	1			X	
BH03_3.5	20-Sep-23		Soil	Ice	J	1			X	
BH03_4.0	20-Sep-23		Soil	Ice	J	1			X	
BH04_paver	20-Sep-23		Soil	Ice	J	1			X	
BH04_0.1	20-Sep-23		Soil	Ice	J	1			X	
BH04_0.5	20-Sep-23		Soil	Ice	J	1		X		
BH04_1.0	20-Sep-23		Soil	Ice	J	1			X	
BH04_1.5	20-Sep-23		Soil	Ice	J	1			X	
BH04_2.0	20-Sep-23		Soil	Ice	J	1		X		
BH04_2.5	20-Sep-23		Soil	Ice	J	1			X	
BH04_3.0	20-Sep-23		Soil	Ice	J	1			X	
BH04_3.5	20-Sep-23		Soil	Ice	J	1			X	
BH04_4.0	20-Sep-23		Soil	Ice	J	1			X	
BH05_0.1	20-Sep-23		Soil	Ice	J	1		X		
BH05_0.5	20-Sep-23		Soil	Ice	J	1			X	
BH05_1.0	20-Sep-23		Soil	Ice	J	1		X		
BH05_1.5	20-Sep-23		Soil	Ice	J	1			X	
BH05_2.0	20-Sep-23		Soil	Ice	J	1			X	
BH05_2.5	20-Sep-23		Soil	Ice	J	1			X	
BH05_3.0	20-Sep-23		Soil	Ice	J	1			X	
BH05_3.5	20-Sep-23		Soil	Ice	J	1			X	
TOTAL NUMBER OF SAMPLES	111									
TOTAL NUMBER OF ESKIES	1									

SAMPLE COMMENTS

CUSTODY DETAILS

SAMPLER	Date/Time	Relinquished by:	Date/Time
GHD SERVICE CENTRE Received by:	Date/Time	Relinquished by:	Date/Time
COURIER Received by Courier:	Date/Time	Relinquished by:	Date/Time
LABORATORY Received by Lab:	Date/Time		

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number	**Laboratory**
12518807	Eurofins Environmental
Project Name	**Laboratory Address**
MFB Port Pirie DSI	8 Mars Terrace, Richmond SA 5033
GHD Project Manager	**Laboratory Contact**
Tom Duncan	Amy Meunier
GHD Contact	
Ally Kristian	
GHD PM email	**GHD Contact email**
Tom.Duncan@ghd.com	Ally.Kristian@ghd.com

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
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- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.	Date and Time	Composite Sample	Sample Matrix W: Water A: Air SW: surface water GW: groundwater	Preservative	Containers: Type J: soil jar G: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
BH05_4.0	20-Sep-23		Soil	Ice	J	1			X		
SS01	21-Sep-23		Soil	Ice	J	1		X			
SS02	21-Sep-23		Soil	Ice	J	1		X			
SS03	21-Sep-23		Soil	Ice	J	1		X			
SS04	21-Sep-23		Soil	Ice	J	1		X			
SS05	21-Sep-23		Soil	Ice	J	1		X			
SS06	21-Sep-23		Soil	Ice	J	1		X			
SS07	21-Sep-23		Soil	Ice	J	1		X			
SS08	21-Sep-23		Soil	Ice	J	1		X			
SS09	21-Sep-23		Soil	Ice	J	1		X			
MW01_0.1	21-Sep-23		Soil	Ice	J	1			X		
MW01_0.5	21-Sep-23		Soil	Ice	J	1		X			
MW01_1.0	21-Sep-23		Soil	Ice	J	1			X		
MW01_1.5	21-Sep-23		Soil	Ice	J	1		X			
MW01_2.0	21-Sep-23		Soil	Ice	J	1			X		
MW01_2.5	21-Sep-23		Soil	Ice	J	1			X		
MW01_3.0	21-Sep-23		Soil	Ice	J	1			X		
MW01_3.5	21-Sep-23		Soil	Ice	J	1			X		
MW01_4.0	21-Sep-23		Soil	Ice	J	1			X		
MW02_0.1	21-Sep-23		Soil	Ice	J	1		X			
MW02_0.5	21-Sep-23		Soil	Ice	J	1			X		
MW02_1.0	21-Sep-23		Soil	Ice	J	1			X		
TOTAL NUMBER OF SAMPLES	111										
TOTAL NUMBER OF ESKIES	3										

CUSTODY DETAILS

SAMPLER			
	Date/Time	Relinquished by	Date/Time
GHD SERVICE CENTRE			
Received by:	Date/Time	Relinquished by	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by	Date/Time
LABORATORY			
Received by Lab:	Date/Time		

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number	12616807
Project Name	MFS Port Pirie DSI
GHD Project Manager	Tom Duncan
GHD Contact	Ally Kriiman
GHD PM email	Tom.Duncan@ghd.com
GHD Contact email	Ally.Kriiman@ghd.com
Laboratory	Eurofins Environmental
Laboratory Address	8 Main Terrace, Richmond SA 5033
Laboratory Contact	Amy Maurer

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on receipt and release of samples, between each party.
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- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.	Date and Time	Composite Sample	Sample Matrix W: Soil S: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
MW02_1.5	21-Sep-23		Soil	Ice	J	1			X		
MW02_2.0	21-Sep-23		Soil	Ice	J	1			X		
MW02_2.5	21-Sep-23		Soil	Ice	J	1			X		
MW02_3.0	21-Sep-23		Soil	Ice	J	1		X			
MW02_3.5	21-Sep-23		Soil	Ice	J	1			X		
MW02_4.0	21-Sep-23		Soil	Ice	J	1			X		
MW03_silver	21-Sep-23		Soil	Ice	J	1			X		
MW03_0.1	21-Sep-23		Soil	Ice	J	1			X		
MW03_0.5	21-Sep-23		Soil	Ice	J	1		X			
MW03_1.0	21-Sep-23		Soil	Ice	J	1			X		
MW03_1.5	21-Sep-23		Soil	Ice	J	1			X		
MW03_2.0	21-Sep-23		Soil	Ice	J	1			X		
MW03_2.5	21-Sep-23		Soil	Ice	J	1			X		
MW03_3.0	21-Sep-23		Soil	Ice	J	1			X		
MW03_3.5	21-Sep-23		Soil	Ice	J	1		X			
MW03_4.0	21-Sep-23		Soil	Ice	J	1			X		
FB01	20-Sep-23		Water	Ice	P	1		X			
RB01	20-Sep-23		Water	Ice	P	1		X			
RB02	21-Sep-23		Water	Ice	P	1		X			
TOTAL NUMBER OF SAMPLES	111										
TOTAL NUMBER OF ESKIES	2										

CUSTODY DETAILS

SAMPLER			
	Date/Time	Relinquished by	Date/Time
GHD SERVICE CENTRE			
Received by:	Date/Time	Relinquished by	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by	Date/Time
LABORATORY			
Received by Lab:	Date/Time		

GHD

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address
Level 4 - 211 Victoria Square, Adelaide SA 5000
Telephone: (08) 8111 6600

Completion Date / Turnaround
STANDARD

Quote #
Quote GHD STANDARD RATES

Project Number
[illegible]

Project Name
MFS Port Pirie DSI

GHD Project Manager
Tom Duncan

GHD Contact
Ally Kirkman

GHD PM email
Tom.Duncan@ghd.com

GHD Contact email
Ally.Kirkman@ghd.com

Laboratory
Eurofins Environmental

Laboratory Address
9 Mait Terrace, Richmond SA 5033

Laboratory Contact
Parnnal Acharya

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
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FD01	20-Sep-23		Soil	Ice	J	1			X		
FS01	20-Sep-23		Soil	Ice	J	1			X		
FD02	20-Sep-23		Soil	Ice	J	1		X			
FS02	20-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
FD03	20-Sep-23		Soil	Ice	J	1			X		
FS03	20-Sep-23		Soil	Ice	J	1			X		
FD04	20-Sep-23		Soil	Ice	J	1			X		
FS04	20-Sep-23		Soil	Ice	J	1			X		
FD05	21-Sep-23		Soil	Ice	J	1		X			
FS05	21-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
FD06	21-Sep-23		Soil	Ice	J	1		X			
FS06	21-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
FD07	21-Sep-23		Soil	Ice	J	1			X		
FS07	21-Sep-23		Soil	Ice	J	1			X		

TOTAL NUMBER OF SAMPLES	111
TOTAL NUMBER OF ESKIES	2

CUSTODY DETAILS

SAMPLER

GHD SERVICE CENTRE Received by:	Date/Time	Relinquished by	Date/Time
COURIER Received by Courier:	Date/Time	Relinquished by	Date/Time
LABORATORY Received by Lab:	Date/Time	Relinquished by:	Date/Time

14 EG

COPY

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number 12618807	**Laboratory** Eurofins Environmental
Project Name MFS Port Pirie DSI	**Laboratory Address** 6 Main Terrace, Richmond SA 5033
GHD Project Manager Tom Duncan	**Laboratory Contact** Parimal Acharya
GHD Contact Ally Kirkman	
GHD PM email Tom.Duncan@ghd.com	**GHD Contact email** Ally.Kirkman@ghd.com

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
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Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil, SL: Sludge, W: Water, A: Air, GW: Groundwater	Preservative	Type J: soil jar, B: bag, V: vial, G: glass bottle, P: plastic bottle	Number	Volume (ml)	PFAS Full 30 Analyte Suite	HOLD	SEND TO ALS	SAMPLE COMMENTS
FD01	20-Sep-23		Soil	Ice	J	1			X		
FS01	20-Sep-23		Soil	Ice	J	1			X		
FD02	20-Sep-23		Soil	Ice	J	1		X			
FS02	20-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
FD03	20-Sep-23		Soil	Ice	J	1			X		
FS03	20-Sep-23		Soil	Ice	J	1			X		
FD04	20-Sep-23		Soil	Ice	J	1			X		
FS04	20-Sep-23		Soil	Ice	J	1			X		
FD05	21-Sep-23		Soil	Ice	J	1		X			
FS05	21-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
FD06	21-Sep-23		Soil	Ice	J	1		X			
FS06	21-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
FD07	21-Sep-23		Soil	Ice	J	1			X		
FS07	21-Sep-23		Soil	Ice	J	1			X		
TOTAL NUMBER OF SAMPLES	111										
TOTAL NUMBER OF ESKIES	2										

CUSTODY DETAILS

SAMPLER	Date/Time	Relinquished by	Date/Time
GHD SERVICE CENTRE Received by:	Date/Time	Relinquished by	Date/Time
COURIER Received by Courier:	Date/Time	Relinquished by	Date/Time
LABORATORY Received by Lab:	Date/Time		

#1029918

27/9/23

Tyrone Gowans

From: Amy Meunier
Sent: Wednesday, 27 September 2023 3:25 PM
To: #AU_CAU001_EnviroSampleVic
Subject: FW: Samples Received
Attachments: 12616806_CoC_Peterborough_DSI.pdf; 12616807_CoC_Port_Pirie_DSI.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Hi Tyrone – COCs attached thanks

Kind regards,

Amy Meunier

Analytical Services Manager
Mobile : +61 477 574 867
Email : AmyMeunier@eurofins.com

Eurofins
6 Monterey Road,
Dandenong VIC 3175
Australia

My office hours are 9am to 5:30pm (Monday to Friday)
If you require sample receipt outside these hours please email envirosamplevic@eurofins.com

From: Ally Kirkman <Ally.Kirkman@ghd.com>
Sent: Wednesday, 27 September 2023 3:19 PM
To: Amy Meunier <AmyMeunier@eurofins.com>
Cc: Parimal Acharya <ParimalAcharya@eurofins.com>; Tom Duncan <Thomas.Duncan@ghd.com>
Subject: RE: Samples Received

Hi Amy,

Apologies for the delay. Attached are the COCs for each job.

Reach out if you have any questions.

Cheers,
Ally

#1029905

From: Amy Meunier <AmyMeunier@eurofins.com>
Sent: Wednesday, September 27, 2023 9:16 AM

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PROJECT INFORMATION

Date Received: 25/9/23

Company: GHD

Contact person: Ally Kirkman

Contact Number:

Contact E-mail:

Project Name/site: 12616807

Project Number:

COC: **Attached** ☐
E-mailed ☑
Not received ☐

10.3°C
− 0.3°C
10.0°C
on ice

Last modified on: 16 October 2019	Approved on: 16 October 2019	Version: QS1039_R2
Last modified by: H. Le	Approver: M. Makarios	Page 1 of 1
Editorial Committee: T. Lakeland, F. Sanjaya, H. Le, M. Makarios		Next required review date: 16 October 2022

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www.eurofins.com.au EnviroSales@eurofins.com

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ABN: 50 005 085 521

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6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377
Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rorke Road	43 Detroit Drive	1277 Cameron Road,
Penrose,	Rolleston,	Gate Pa,
Auckland 1061	Christchurch 7675	Tauranga 3112
Tel: +64 9 526 4551	Tel: +64 3 343 5201	Tel: +64 9 525 0568
IANZ# 1327	IANZ# 1290	IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd SA
Contact name:	Ally Kirkman
Project name:	MFS PIRT PIRIE DSI
Project ID:	12616807
Turnaround time:	5 Day
Date/Time received	Sep 27, 2023 3:25 PM
Eurofins reference	1029918

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✗	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✓	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

EXTRA SAMPLE MW01_PAVER RECEIVED AND PLACED ON HOLD

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Amy Meunier on phone : or by email: AmyMeunier@eurofins.com

Results will be delivered electronically via email to Ally Kirkman - ally.kirkman@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd SA email address.

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Tel: +64 9 526 4551	Tel: +64 3 343 5201	Tel: +64 9 525 0568
IANZ# 1327	IANZ# 1290	IANZ# 1402

Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS PIRT PIRIE DSI
Project ID: 12616807

Order No.:
Report #: 1029918
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Sep 27, 2023 3:25 PM
Due: Oct 5, 2023
Priority: 5 Day
Contact Name: Ally Kirkman

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	BH01_0.1	Sep 20, 2023		Soil	M23-Se0065218		X	X
2	BH01_1.5	Sep 20, 2023		Soil	M23-Se0065219		X	X
3	BH02_0.1	Sep 20, 2023		Soil	M23-Se0065220		X	X
4	BH02_2.0	Sep 20, 2023		Soil	M23-Se0065221		X	X
5	BH03_0.5	Sep 20, 2023		Soil	M23-Se0065222		X	X
6	BH03_1.5	Sep 20, 2023		Soil	M23-Se0065223		X	X
7	BH04_0.5	Sep 20, 2023		Soil	M23-Se0065224		X	X
8	BH04_2.0	Sep 20, 2023		Soil	M23-Se0065225		X	X
9	BH05_0.1	Sep 20, 2023		Soil	M23-Se0065226		X	X
10	BH05_1.0	Sep 20, 2023		Soil	M23-Se0065227		X	X
11	SS01	Sep 21, 2023		Soil	M23-Se0065228		X	X
12	SS02	Sep 21, 2023		Soil	M23-Se0065229		X	X
13	SS03	Sep 21, 2023		Soil	M23-Se0065230		X	X

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

Eurofins ARL Pty Ltd
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Tel: +64 9 526 4551	Tel: +64 3 343 5201	Tel: +64 9 525 0568
IANZ# 1327	IANZ# 1290	IANZ# 1402

Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS PIRT PIRIE DSI
Project ID: 12616807

Order No.:
Report #: 1029918
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Sep 27, 2023 3:25 PM
Due: Oct 5, 2023
Priority: 5 Day
Contact Name: Ally Kirkman

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
14	SS04	Sep 21, 2023		Soil	M23-Se0065231		X	X
15	SS05	Sep 21, 2023		Soil	M23-Se0065232		X	X
16	SS06	Sep 21, 2023		Soil	M23-Se0065233		X	X
17	SS07	Sep 21, 2023		Soil	M23-Se0065234		X	X
18	SS08	Sep 21, 2023		Soil	M23-Se0065235		X	X
19	SS09	Sep 21, 2023		Soil	M23-Se0065236		X	X
20	MW01_0.5	Sep 21, 2023		Soil	M23-Se0065237		X	X
21	MW01_1.5	Sep 21, 2023		Soil	M23-Se0065238		X	X
22	MW02_0.1	Sep 21, 2023		Soil	M23-Se0065239		X	X
23	MW02_3.0	Sep 21, 2023		Soil	M23-Se0065240		X	X
24	MW03_0.5	Sep 21, 2023		Soil	M23-Se0065241		X	X
25	MW03_3.5	Sep 21, 2023		Soil	M23-Se0065242		X	X
26	FB01	Sep 20, 2023		Water	M23-Se0065243			X
27	RB01	Sep 20, 2023		Water	M23-Se0065244			X
28	RB02	Sep 21, 2023		Water	M23-Se0065245			X
29	FD02	Sep 20, 2023		Soil	M23-Se0065246		X	X

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

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Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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ABN: 91 05 0159 898

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Site# 2370

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NZBN: 9429046024954

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IANZ# 1327	IANZ# 1290	IANZ# 1402

Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS PIRT PIRIE DSI
Project ID: 12616807

Order No.:
Report #: 1029918
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Sep 27, 2023 3:25 PM
Due: Oct 5, 2023
Priority: 5 Day
Contact Name: Ally Kirkman

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
30	FD05	Sep 21, 2023		Soil	M23-Se0065247		X	X
31	FD06	Sep 21, 2023		Soil	M23-Se0065248		X	X
32	BH01_0.5	Sep 20, 2023		Soil	M23-Se0065249	X		
33	BH01_1.0	Sep 20, 2023		Soil	M23-Se0065250	X		
34	BH01_2.0	Sep 20, 2023		Soil	M23-Se0065251	X		
35	BH01_2.5	Sep 20, 2023		Soil	M23-Se0065252	X		
36	BH01_3.0	Sep 20, 2023		Soil	M23-Se0065253	X		
37	BH01_3.5	Sep 20, 2023		Soil	M23-Se0065254	X		
38	BH01_4.0	Sep 20, 2023		Soil	M23-Se0065255	X		
39	BH02_0.5	Sep 20, 2023		Soil	M23-Se0065256	X		
40	BH02_1.0	Sep 20, 2023		Soil	M23-Se0065257	X		
41	BH02_1.5	Sep 20, 2023		Soil	M23-Se0065258	X		
42	BH02_2.5	Sep 20, 2023		Soil	M23-Se0065259	X		
43	BH02_3.0	Sep 20, 2023		Soil	M23-Se0065260	X		
44	BH02_3.5	Sep 20, 2023		Soil	M23-Se0065261	X		
45	BH02_4.0	Sep 20, 2023		Soil	M23-Se0065262	X		

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Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
46	BH03_PAVER	Sep 20, 2023		Soil	M23-Se0065263	X		
47	BH03_0.1	Sep 20, 2023		Soil	M23-Se0065264	X		
48	BH03_1.0	Sep 20, 2023		Soil	M23-Se0065265	X		
49	BH03_2.0	Sep 20, 2023		Soil	M23-Se0065266	X		
50	BH03_2.5	Sep 20, 2023		Soil	M23-Se0065267	X		
51	BH03_3.0	Sep 20, 2023		Soil	M23-Se0065268	X		
52	BH03_3.5	Sep 20, 2023		Soil	M23-Se0065269	X		
53	BH03_4.0	Sep 20, 2023		Soil	M23-Se0065270	X		
54	BH04_PAVER	Sep 20, 2023		Soil	M23-Se0065271	X		
55	BH04_0.1	Sep 20, 2023		Soil	M23-Se0065272	X		
56	BH04_1.0	Sep 20, 2023		Soil	M23-Se0065273	X		
57	BH04_1.5	Sep 20, 2023		Soil	M23-Se0065274	X		
58	BH04_2.5	Sep 20, 2023		Soil	M23-Se0065275	X		
59	BH04_3.0	Sep 20, 2023		Soil	M23-Se0065276	X		
60	BH04_3.5	Sep 20, 2023		Soil	M23-Se0065277	X		
61	BH04_4.0	Sep 20, 2023		Soil	M23-Se0065278	X		

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
62	BH05_0.5	Sep 20, 2023		Soil	M23-Se0065279	X		
63	BH05_1.5	Sep 20, 2023		Soil	M23-Se0065280	X		
64	BH05_2.0	Sep 20, 2023		Soil	M23-Se0065281	X		
65	BH05_2.5	Sep 20, 2023		Soil	M23-Se0065282	X		
66	BH05_3.0	Sep 20, 2023		Soil	M23-Se0065283	X		
67	BH05_3.5	Sep 20, 2023		Soil	M23-Se0065284	X		
68	BH05_4.0	Sep 20, 2023		Soil	M23-Se0065285	X		
69	MW01_0.1	Sep 21, 2023		Soil	M23-Se0065286	X		
70	MW01_1.0	Sep 21, 2023		Soil	M23-Se0065287	X		
71	MW01_2.0	Sep 21, 2023		Soil	M23-Se0065288	X		
72	MW01_2.5	Sep 21, 2023		Soil	M23-Se0065289	X		
73	MW01_3.0	Sep 21, 2023		Soil	M23-Se0065290	X		
74	MW01_3.5	Sep 21, 2023		Soil	M23-Se0065291	X		
75	MW01_4.0	Sep 21, 2023		Soil	M23-Se0065292	X		
76	MW02_0.5	Sep 21, 2023		Soil	M23-Se0065293	X		
77	MW02_1.0	Sep 21, 2023		Soil	M23-Se0065294	X		

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Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
78	MW02_1.5	Sep 21, 2023		Soil	M23-Se0065295	X		
79	MW02_2.0	Sep 21, 2023		Soil	M23-Se0065296	X		
80	MW02_2.5	Sep 21, 2023		Soil	M23-Se0065297	X		
81	MW02_3.5	Sep 21, 2023		Soil	M23-Se0065298	X		
82	MW02_4.0	Sep 21, 2023		Soil	M23-Se0065299	X		
83	MW03_PAVER	Sep 21, 2023		Soil	M23-Se0065300	X		
84	MW03_0.1	Sep 21, 2023		Soil	M23-Se0065301	X		
85	MW03_1.0	Sep 21, 2023		Soil	M23-Se0065302	X		
86	MW03_1.5	Sep 21, 2023		Soil	M23-Se0065303	X		
87	MW03_2.0	Sep 21, 2023		Soil	M23-Se0065304	X		
88	MW03_2.5	Sep 21, 2023		Soil	M23-Se0065305	X		
89	MW03_3.0	Sep 21, 2023		Soil	M23-Se0065306	X		
90	MW03_4.0	Sep 21, 2023		Soil	M23-Se0065307	X		
91	FD01	Sep 20, 2023		Soil	M23-Se0065308	X		
92	FS01	Sep 20, 2023		Soil	M23-Se0065309	X		

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Project Name: MFS PIRT PIRIE DSI
Project ID: 12616807

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
93	FD03	Sep 20, 2023		Soil	M23-Se0065310	X		
94	FS03	Sep 20, 2023		Soil	M23-Se0065311	X		
95	FD04	Sep 20, 2023		Soil	M23-Se0065312	X		
96	FS04	Sep 20, 2023		Soil	M23-Se0065313	X		
97	FD07	Sep 21, 2023		Soil	M23-Se0065314	X		
98	FS07	Sep 21, 2023		Soil	M23-Se0065315	X		
99	MW01_PAVER	Sep 21, 2023		Soil	M23-Se0065316	X		
Test Counts						68	28	31

GHD Pty Ltd
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Attention: **Ally Kirkman**

Report **1029918-S**
Project name MFS PIRT PIRIE DSI
Project ID 12616807
Received Date Sep 27, 2023

Client Sample ID			**BH01_0.1**	**BH01_1.5**	**BH02_0.1**	**BH02_2.0**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**M23-Se0065218**	**M23-Se0065219**	**M23-Se0065220**	**M23-Se0065221**
Date Sampled			**Sep 20, 2023**	**Sep 20, 2023**	**Sep 20, 2023**	**Sep 20, 2023**
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	7.4	17	2.5	16
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	5.9	< 5	7.4	31
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	[N09]6.7	< 5	< 5	[N09]13
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	5.0	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	13	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	91	73	78	72
13C5-PFPeA (surr.)	1	%	96	93	96	95
13C5-PFHxA (surr.)	1	%	111	107	111	102
13C4-PFHpA (surr.)	1	%	85	87	84	100
13C8-PFOA (surr.)	1	%	85	82	84	92
13C5-PFNA (surr.)	1	%	90	86	92	94
13C6-PFDA (surr.)	1	%	96	96	102	104
13C2-PFUnDA (surr.)	1	%	106	100	103	111
13C2-PFDoDA (surr.)	1	%	116	107	108	111
13C2-PFTeDA (surr.)	1	%	79	81	79	78
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	[N09]6.3	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10

Client Sample ID			BH01_0.1	BH01_1.5	BH02_0.1	BH02_2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065218	M23-Se0065219	M23-Se0065220	M23-Se0065221
Date Sampled			Sep 20, 2023	Sep 20, 2023	Sep 20, 2023	Sep 20, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
13C8-FOSA (surr.)	1	%	99	95	95	113
D3-N-MeFOSA (surr.)	1	%	109	101	95	119
D5-N-EtFOSA (surr.)	1	%	90	86	78	111
D7-N-MeFOSE (surr.)	1	%	82	82	74	103
D9-N-EtFOSE (surr.)	1	%	91	79	74	100
D5-N-EtFOSAA (surr.)	1	%	94	81	86	87
D3-N-MeFOSAA (surr.)	1	%	103	87	90	90
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	< 5	[N09]21
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	[N09]9.0	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	7.2
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	< 5	[N09]23
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]44	[N09]11	[N09]6.4	[N09]240
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	[N09]9.9	< 5	< 5	[N09]12
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]600	[N09]9.4	[N09]1100	[N09]190
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	102	97	104	93
18O2-PFHxS (surr.)	1	%	95	107	95	98
13C8-PFOS (surr.)	1	%	101	96	94	96
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	22	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	25	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	91	87	89	98
13C2-6:2 FTSA (surr.)	1	%	78	75	86	85
13C2-8:2 FTSA (surr.)	1	%	96	98	96	91
13C2-10:2 FTSA (surr.)	1	%	108	101	105	103
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	644	20.4	1106.4	430
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	606.7	9.4	1100	203
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	650.7	20.4	1106.4	443
Sum of WA DWER PFAS (n=10)*	10	ug/kg	703.6	20.4	1113.8	495
Sum of PFASs (n=30)*	50	ug/kg	724.8	< 50	1135.8	537.2

Client Sample ID			BH03_0.5	BH03_1.5	BH04_0.5	BH04_2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065222	M23-Se0065223	M23-Se0065224	M23-Se0065225
Date Sampled			Sep 20, 2023	Sep 20, 2023	Sep 20, 2023	Sep 20, 2023
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	8.4	23	5.7	22
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	6.0	8.4	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	50	45	< 5	10
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	[N09]12	[N09]13	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	[N09]9.6	[N09]8.1	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	[N09]26	10	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	87	74	92	65
13C5-PFPeA (surr.)	1	%	103	93	106	85
13C5-PFHxA (surr.)	1	%	110	105	108	98
13C4-PFHpA (surr.)	1	%	101	105	96	89
13C8-PFOA (surr.)	1	%	96	89	98	89
13C5-PFNA (surr.)	1	%	89	84	93	89
13C6-PFDA (surr.)	1	%	100	100	105	95
13C2-PFUnDA (surr.)	1	%	117	108	123	104
13C2-PFDoDA (surr.)	1	%	122	110	118	105
13C2-PFTeDA (surr.)	1	%	86	74	87	79
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	113	107	113	107
D3-N-MeFOSA (surr.)	1	%	126	114	121	112
D5-N-EtFOSA (surr.)	1	%	117	102	115	105
D7-N-MeFOSE (surr.)	1	%	102	92	97	92
D9-N-EtFOSE (surr.)	1	%	104	96	100	92
D5-N-EtFOSAA (surr.)	1	%	111	95	108	83
D3-N-MeFOSAA (surr.)	1	%	111	100	110	86
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	[N09]21	[N09]27	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	5.6	12	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	[N09]24	[N09]21	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]100	[N09]110	< 5	[N09]8.1
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	5.5	< 5	< 5

Client Sample ID			BH03_0.5	BH03_1.5	BH04_0.5	BH04_2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065222	M23-Se0065223	M23-Se0065224	M23-Se0065225
Date Sampled			Sep 20, 2023	Sep 20, 2023	Sep 20, 2023	Sep 20, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]120	[N09]110	[N09]59	[N09]32
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	98	90	98	92
18O2-PFHxS (surr.)	1	%	104	98	108	97
13C8-PFOS (surr.)	1	%	96	95	102	98
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	102	98	106	91
13C2-6:2 FTSA (surr.)	1	%	88	84	98	91
13C2-8:2 FTSA (surr.)	1	%	96	95	108	96
13C2-10:2 FTSA (surr.)	1	%	128	119	118	108
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	220	220	59	40.1
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	129.6	118.1	59	32
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	229.6	228.1	59	40.1
Sum of WA DWER PFAS (n=10)*	10	ug/kg	318.6	321.5	59	50.1
Sum of PFASs (n=30)*	50	ug/kg	374.2	370	59	50.1

Client Sample ID			BH05_0.1	BH05_1.0	SS01	SS02
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065226	M23-Se0065227	M23-Se0065228	M23-Se0065229
Date Sampled			Sep 20, 2023	Sep 20, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	9.7	23	8.0	7.0
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	20	12	7.8
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	36	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	200	11	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	[N09]18	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	[N09]29	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	67	10	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	90	75	56	70
13C5-PFPeA (surr.)	1	%	99	96	36	84
13C5-PFHxA (surr.)	1	%	107	100	54	102
13C4-PFHpA (surr.)	1	%	98	94	52	83

Client Sample ID			BH05_0.1	BH05_1.0	SS01	SS02
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065226	M23-Se0065227	M23-Se0065228	M23-Se0065229
Date Sampled			Sep 20, 2023	Sep 20, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C8-PFOA (surr.)	1	%	101	91	36	64
13C5-PFNA (surr.)	1	%	94	93	102	56
13C6-PFDA (surr.)	1	%	109	102	25	55
13C2-PFUnDA (surr.)	1	%	115	112	33	20
13C2-PFDoDA (surr.)	1	%	117	115	12	28
13C2-PFTeDA (surr.)	1	%	89	85	17	38
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	120	115	22	39
D3-N-MeFOSA (surr.)	1	%	124	115	37	54
D5-N-EtFOSA (surr.)	1	%	116	113	27	45
D7-N-MeFOSE (surr.)	1	%	99	101	19	37
D9-N-EtFOSE (surr.)	1	%	102	101	18	36
D5-N-EtFOSAA (surr.)	1	%	106	97	15	25
D3-N-MeFOSAA (surr.)	1	%	109	96	12	19
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	[N09]100	[N09]17	[N09]20
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	[N09]14	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	34	5.3	7.1
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	[N09]95	[N09]5.6	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	[N09]530	[N09]34	[N09]8.3
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	[N09]24	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]280	[N09]1400	[N09]120	[N09]48
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	[N09]6.5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	98	92	67	97
18O2-PFHxS (surr.)	1	%	103	86	149	80
13C8-PFOS (surr.)	1	%	98	121	122	74
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	97	103	100	116
13C2-6:2 FTSA (surr.)	1	%	98	96	71	71
13C2-8:2 FTSA (surr.)	1	%	103	103	22	41
13C2-10:2 FTSA (surr.)	1	%	124	117	15	23

Client Sample ID			BH05_0.1	BH05_1.0	SS01	SS02
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065226	M23-Se0065227	M23-Se0065228	M23-Se0065229
Date Sampled			Sep 20, 2023	Sep 20, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	280	1930	154	56.3
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	280	1429	120	48
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	280	1959	154	56.3
Sum of WA DWER PFAS (n=10)*	10	ug/kg	280	2333	194	84.1
Sum of PFASs (n=30)*	50	ug/kg	300.5	2553	214.9	91.2

Client Sample ID			SS03	SS04	SS05	SS06
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065230	M23-Se0065231	M23-Se0065232	M23-Se0065233
Date Sampled			Sep 21, 2023	Sep 21, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	31	11.5	30	13
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	53	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	32	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	40	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	[N09]8.6	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	[N09]55	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	65	52	84	89
13C5-PFPeA (surr.)	1	%	79	52	94	102
13C5-PFHxA (surr.)	1	%	93	73	105	109
13C4-PFHpA (surr.)	1	%	78	54	82	99
13C8-PFOA (surr.)	1	%	55	117	63	95
13C5-PFNA (surr.)	1	%	51	24	61	92
13C6-PFDA (surr.)	1	%	50	19	58	105
13C2-PFUnDA (surr.)	1	%	17	39	43	96
13C2-PFDoDA (surr.)	1	%	28	52	37	98
13C2-PFTeDA (surr.)	1	%	34	101	34	85
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	[N09]10	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10

Client Sample ID			SS03	SS04	SS05	SS06
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065230	M23-Se0065231	M23-Se0065232	M23-Se0065233
Date Sampled			Sep 21, 2023	Sep 21, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
13C8-FOSA (surr.)	1	%	35	65	40	93
D3-N-MeFOSA (surr.)	1	%	53	26	55	119
D5-N-EtFOSA (surr.)	1	%	41	18	47	103
D7-N-MeFOSE (surr.)	1	%	34	16	39	94
D9-N-EtFOSE (surr.)	1	%	32	17	37	94
D5-N-EtFOSAA (surr.)	1	%	22	14	31	92
D3-N-MeFOSAA (surr.)	1	%	16	11	31	80
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	5.8	[N09]44	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	[N09]100	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	46	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	[N09]19	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]16	[N09]230	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	[N09]33	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]110	[N09]5600	[N09]44	[N09]22
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	[N09]71	< 5	[N09]10
13C3-PFBS (surr.)	1	%	89	79	95	100
18O2-PFHxS (surr.)	1	%	63	51	77	103
13C8-PFOS (surr.)	1	%	60	114	72	93
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	98	82	92	94
13C2-6:2 FTSA (surr.)	1	%	63	31	62	99
13C2-8:2 FTSA (surr.)	1	%	33	13	50	95
13C2-10:2 FTSA (surr.)	1	%	17	10	24	87
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	126	5830	44	22
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	110	5655	44	22
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	126	5885	44	22
Sum of WA DWER PFAS (n=10)*	10	ug/kg	131.8	6062.6	44	22
Sum of PFASs (n=30)*	50	ug/kg	131.8	6341.6	< 50	< 50

Client Sample ID			SS07	SS08	SS09	MW01_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065234	M23-Se0065235	M23-Se0065236	M23-Se0065237
Date Sampled			Sep 21, 2023	Sep 21, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	4.9	4.2	3.1	6.4
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5	< 5	7.0
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5	< 5	[N09]5.4
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	29	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	8.2	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	91	98	96	97
13C5-PFPeA (surr.)	1	%	103	110	106	109
13C5-PFHxA (surr.)	1	%	113	123	119	119
13C4-PFHpA (surr.)	1	%	104	108	110	106
13C8-PFOA (surr.)	1	%	97	109	104	103
13C5-PFNA (surr.)	1	%	90	93	87	88
13C6-PFDA (surr.)	1	%	107	105	103	107
13C2-PFUnDA (surr.)	1	%	95	121	112	116
13C2-PFDoDA (surr.)	1	%	107	117	117	122
13C2-PFTeDA (surr.)	1	%	104	110	102	97
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	102	110	115	116
D3-N-MeFOSA (surr.)	1	%	119	131	133	129
D5-N-EtFOSA (surr.)	1	%	112	121	123	117
D7-N-MeFOSE (surr.)	1	%	92	100	103	103
D9-N-EtFOSE (surr.)	1	%	94	98	109	104
D5-N-EtFOSAA (surr.)	1	%	103	140	146	154
D3-N-MeFOSAA (surr.)	1	%	77	132	134	139
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	[N09]9.5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	< 5	< 5	[N09]33
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5

Client Sample ID			SS07	SS08	SS09	MW01_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065234	M23-Se0065235	M23-Se0065236	M23-Se0065237
Date Sampled			Sep 21, 2023	Sep 21, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]54	[N09]120	< 5	[N09]100
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	[N09]5.5	[N09]17	< 5	< 5
13C3-PFBS (surr.)	1	%	105	115	104	107
18O2-PFHxS (surr.)	1	%	108	112	106	105
13C8-PFOS (surr.)	1	%	101	102	102	102
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	112	105	102	99
13C2-6:2 FTSA (surr.)	1	%	133	130	133	110
13C2-8:2 FTSA (surr.)	1	%	102	102	98	94
13C2-10:2 FTSA (surr.)	1	%	93	157	150	161
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	54	120	< 5	133
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	54	120	< 5	105.4
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	54	120	< 5	138.4
Sum of WA DWER PFAS (n=10)*	10	ug/kg	54	120	< 10	145.4
Sum of PFASs (n=30)*	50	ug/kg	59.5	183.7	< 50	145.4

Client Sample ID			MW01_1.5	MW02_0.1	MW02_3.0	MW03_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065238	M23-Se0065239	M23-Se0065240	M23-Se0065241
Date Sampled			Sep 21, 2023	Sep 21, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	15	7.6	26	16
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	5.8	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	11	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	76	< 5	< 5	7.0
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	[N09]6.0	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	[N09]22	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	85	96	95	88
13C5-PFPeA (surr.)	1	%	100	106	106	103
13C5-PFHxA (surr.)	1	%	111	116	124	116
13C4-PFHpA (surr.)	1	%	101	102	98	100

Client Sample ID			MW01_1.5	MW02_0.1	MW02_3.0	MW03_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065238	M23-Se0065239	M23-Se0065240	M23-Se0065241
Date Sampled			Sep 21, 2023	Sep 21, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C8-PFOA (surr.)	1	%	92	102	100	97
13C5-PFNA (surr.)	1	%	93	97	94	93
13C6-PFDA (surr.)	1	%	102	111	109	108
13C2-PFUnDA (surr.)	1	%	118	128	121	119
13C2-PFDoDA (surr.)	1	%	118	125	105	106
13C2-PFTeDA (surr.)	1	%	92	94	77	77
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	113	110	109	111
D3-N-MeFOSA (surr.)	1	%	123	126	121	132
D5-N-EtFOSA (surr.)	1	%	111	120	120	124
D7-N-MeFOSE (surr.)	1	%	99	104	100	106
D9-N-EtFOSE (surr.)	1	%	100	102	104	105
D5-N-EtFOSAA (surr.)	1	%	107	99	113	107
D3-N-MeFOSAA (surr.)	1	%	108	106	115	107
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	[N09]27	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	10	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	[N09]28	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]350	< 5	< 5	[N09]14
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	[N09]20	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]910	[N09]190	< 5	[N09]68
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	96	103	103	101
18O2-PFHxS (surr.)	1	%	97	106	101	106
13C8-PFOS (surr.)	1	%	94	101	104	106
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	96	91	90	91
13C2-6:2 FTSA (surr.)	1	%	97	85	99	97
13C2-8:2 FTSA (surr.)	1	%	101	98	98	109
13C2-10:2 FTSA (surr.)	1	%	118	101	123	111

Client Sample ID			MW01_1.5	MW02_0.1	MW02_3.0	MW03_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065238	M23-Se0065239	M23-Se0065240	M23-Se0065241
Date Sampled			Sep 21, 2023	Sep 21, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	1260	190	< 5	82
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	932	190	< 5	68
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	1282	190	< 5	82
Sum of WA DWER PFAS (n=10)*	10	ug/kg	1407.8	190	< 10	89
Sum of PFASs (n=30)*	50	ug/kg	1465.8	190	< 50	89

Client Sample ID			MW03_3.5	FD02	FD05	FD06
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065242	M23-Se0065246	M23-Se0065247	M23-Se0065248
Date Sampled			Sep 21, 2023	Sep 20, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	20	24	13	16
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	25	< 5	6.0
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	48	< 5	12
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	220	< 5	98
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	[N09]13	< 5	[N09]8.5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	[N09]16	< 5	[N09]31
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	37	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	75	71	92	77
13C5-PFPeA (surr.)	1	%	97	91	106	93
13C5-PFHxA (surr.)	1	%	105	98	110	102
13C4-PFHpA (surr.)	1	%	99	95	103	81
13C8-PFOA (surr.)	1	%	94	88	94	75
13C5-PFNA (surr.)	1	%	92	88	91	85
13C6-PFDA (surr.)	1	%	105	97	106	86
13C2-PFUnDA (surr.)	1	%	115	113	85	98
13C2-PFDoDA (surr.)	1	%	101	105	94	103
13C2-PFTeDA (surr.)	1	%	76	77	89	79
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10

Client Sample ID			MW03_3.5	FD02	FD05	FD06
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0065242	M23-Se0065246	M23-Se0065247	M23-Se0065248
Date Sampled			Sep 21, 2023	Sep 20, 2023	Sep 21, 2023	Sep 21, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
13C8-FOSA (surr.)	1	%	108	110	98	93
D3-N-MeFOSA (surr.)	1	%	120	119	121	95
D5-N-EtFOSA (surr.)	1	%	117	116	108	78
D7-N-MeFOSE (surr.)	1	%	99	97	97	65
D9-N-EtFOSE (surr.)	1	%	99	100	97	67
D5-N-EtFOSAA (surr.)	1	%	92	89	83	85
D3-N-MeFOSAA (surr.)	1	%	95	94	67	94
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	[N09]130	< 5	[N09]30
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	[N09]7.0	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	43	< 5	10
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	[N09]86	< 5	[N09]34
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]12	[N09]260	< 5	[N09]430
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	[N09]13	< 5	[N09]30
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]8.2	[N09]920	[N09]42	[N09]1100
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	[N09]11	< 5
13C3-PFBS (surr.)	1	%	96	88	102	95
18O2-PFHxS (surr.)	1	%	106	102	107	94
13C8-PFOS (surr.)	1	%	102	102	97	97
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	92	97	97	88
13C2-6:2 FTSA (surr.)	1	%	91	83	96	75
13C2-8:2 FTSA (surr.)	1	%	104	101	103	93
13C2-10:2 FTSA (surr.)	1	%	108	102	73	107
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	20.2	1180	42	1530
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	8.2	936	42	1131
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	20.2	1196	42	1561
Sum of WA DWER PFAS (n=10)*	10	ug/kg	20.2	1632	42	1715.5
Sum of PFASs (n=30)*	50	ug/kg	< 50	1811	60	1789.5

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
% Moisture	Melbourne	Sep 27, 2023	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	Oct 02, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	Oct 02, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	Oct 02, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	Oct 02, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	Sep 27, 2023	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Project Name: MFS PIRT PIRIE DSI
Project ID: 12616807

Order No.:
Report #: 1029918
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Sep 27, 2023 3:25 PM
Due: Oct 5, 2023
Priority: 5 Day
Contact Name: Ally Kirkman

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	BH01_0.1	Sep 20, 2023		Soil	M23-Se0065218		X	X
2	BH01_1.5	Sep 20, 2023		Soil	M23-Se0065219		X	X
3	BH02_0.1	Sep 20, 2023		Soil	M23-Se0065220		X	X
4	BH02_2.0	Sep 20, 2023		Soil	M23-Se0065221		X	X
5	BH03_0.5	Sep 20, 2023		Soil	M23-Se0065222		X	X
6	BH03_1.5	Sep 20, 2023		Soil	M23-Se0065223		X	X
7	BH04_0.5	Sep 20, 2023		Soil	M23-Se0065224		X	X
8	BH04_2.0	Sep 20, 2023		Soil	M23-Se0065225		X	X
9	BH05_0.1	Sep 20, 2023		Soil	M23-Se0065226		X	X
10	BH05_1.0	Sep 20, 2023		Soil	M23-Se0065227		X	X
11	SS01	Sep 21, 2023		Soil	M23-Se0065228		X	X
12	SS02	Sep 21, 2023		Soil	M23-Se0065229		X	X
13	SS03	Sep 21, 2023		Soil	M23-Se0065230		X	X

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Project Name: MFS PIRT PIRIE DSI
Project ID: 12616807

Order No.:
Report #: 1029918
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Sep 27, 2023 3:25 PM
Due: Oct 5, 2023
Priority: 5 Day
Contact Name: Ally Kirkman

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
14	SS04	Sep 21, 2023		Soil	M23-Se0065231		X	X
15	SS05	Sep 21, 2023		Soil	M23-Se0065232		X	X
16	SS06	Sep 21, 2023		Soil	M23-Se0065233		X	X
17	SS07	Sep 21, 2023		Soil	M23-Se0065234		X	X
18	SS08	Sep 21, 2023		Soil	M23-Se0065235		X	X
19	SS09	Sep 21, 2023		Soil	M23-Se0065236		X	X
20	MW01_0.5	Sep 21, 2023		Soil	M23-Se0065237		X	X
21	MW01_1.5	Sep 21, 2023		Soil	M23-Se0065238		X	X
22	MW02_0.1	Sep 21, 2023		Soil	M23-Se0065239		X	X
23	MW02_3.0	Sep 21, 2023		Soil	M23-Se0065240		X	X
24	MW03_0.5	Sep 21, 2023		Soil	M23-Se0065241		X	X
25	MW03_3.5	Sep 21, 2023		Soil	M23-Se0065242		X	X
26	FB01	Sep 20, 2023		Water	M23-Se0065243			X
27	RB01	Sep 20, 2023		Water	M23-Se0065244			X
28	RB02	Sep 21, 2023		Water	M23-Se0065245			X
29	FD02	Sep 20, 2023		Soil	M23-Se0065246		X	X

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Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS PIRT PIRIE DSI
Project ID: 12616807

Order No.:
Report #: 1029918
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Sep 27, 2023 3:25 PM
Due: Oct 5, 2023
Priority: 5 Day
Contact Name: Ally Kirkman

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
30	FD05	Sep 21, 2023		Soil	M23-Se0065247		X	X
31	FD06	Sep 21, 2023		Soil	M23-Se0065248		X	X
32	BH01_0.5	Sep 20, 2023		Soil	M23-Se0065249	X		
33	BH01_1.0	Sep 20, 2023		Soil	M23-Se0065250	X		
34	BH01_2.0	Sep 20, 2023		Soil	M23-Se0065251	X		
35	BH01_2.5	Sep 20, 2023		Soil	M23-Se0065252	X		
36	BH01_3.0	Sep 20, 2023		Soil	M23-Se0065253	X		
37	BH01_3.5	Sep 20, 2023		Soil	M23-Se0065254	X		
38	BH01_4.0	Sep 20, 2023		Soil	M23-Se0065255	X		
39	BH02_0.5	Sep 20, 2023		Soil	M23-Se0065256	X		
40	BH02_1.0	Sep 20, 2023		Soil	M23-Se0065257	X		
41	BH02_1.5	Sep 20, 2023		Soil	M23-Se0065258	X		
42	BH02_2.5	Sep 20, 2023		Soil	M23-Se0065259	X		
43	BH02_3.0	Sep 20, 2023		Soil	M23-Se0065260	X		
44	BH02_3.5	Sep 20, 2023		Soil	M23-Se0065261	X		
45	BH02_4.0	Sep 20, 2023		Soil	M23-Se0065262	X		

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Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
46	BH03_PAVER	Sep 20, 2023		Soil	M23-Se0065263	X		
47	BH03_0.1	Sep 20, 2023		Soil	M23-Se0065264	X		
48	BH03_1.0	Sep 20, 2023		Soil	M23-Se0065265	X		
49	BH03_2.0	Sep 20, 2023		Soil	M23-Se0065266	X		
50	BH03_2.5	Sep 20, 2023		Soil	M23-Se0065267	X		
51	BH03_3.0	Sep 20, 2023		Soil	M23-Se0065268	X		
52	BH03_3.5	Sep 20, 2023		Soil	M23-Se0065269	X		
53	BH03_4.0	Sep 20, 2023		Soil	M23-Se0065270	X		
54	BH04_PAVER	Sep 20, 2023		Soil	M23-Se0065271	X		
55	BH04_0.1	Sep 20, 2023		Soil	M23-Se0065272	X		
56	BH04_1.0	Sep 20, 2023		Soil	M23-Se0065273	X		
57	BH04_1.5	Sep 20, 2023		Soil	M23-Se0065274	X		
58	BH04_2.5	Sep 20, 2023		Soil	M23-Se0065275	X		
59	BH04_3.0	Sep 20, 2023		Soil	M23-Se0065276	X		
60	BH04_3.5	Sep 20, 2023		Soil	M23-Se0065277	X		
61	BH04_4.0	Sep 20, 2023		Soil	M23-Se0065278	X		

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Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
62	BH05_0.5	Sep 20, 2023		Soil	M23-Se0065279	X		
63	BH05_1.5	Sep 20, 2023		Soil	M23-Se0065280	X		
64	BH05_2.0	Sep 20, 2023		Soil	M23-Se0065281	X		
65	BH05_2.5	Sep 20, 2023		Soil	M23-Se0065282	X		
66	BH05_3.0	Sep 20, 2023		Soil	M23-Se0065283	X		
67	BH05_3.5	Sep 20, 2023		Soil	M23-Se0065284	X		
68	BH05_4.0	Sep 20, 2023		Soil	M23-Se0065285	X		
69	MW01_0.1	Sep 21, 2023		Soil	M23-Se0065286	X		
70	MW01_1.0	Sep 21, 2023		Soil	M23-Se0065287	X		
71	MW01_2.0	Sep 21, 2023		Soil	M23-Se0065288	X		
72	MW01_2.5	Sep 21, 2023		Soil	M23-Se0065289	X		
73	MW01_3.0	Sep 21, 2023		Soil	M23-Se0065290	X		
74	MW01_3.5	Sep 21, 2023		Soil	M23-Se0065291	X		
75	MW01_4.0	Sep 21, 2023		Soil	M23-Se0065292	X		
76	MW02_0.5	Sep 21, 2023		Soil	M23-Se0065293	X		
77	MW02_1.0	Sep 21, 2023		Soil	M23-Se0065294	X		

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Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
78	MW02_1.5	Sep 21, 2023		Soil	M23-Se0065295	X		
79	MW02_2.0	Sep 21, 2023		Soil	M23-Se0065296	X		
80	MW02_2.5	Sep 21, 2023		Soil	M23-Se0065297	X		
81	MW02_3.5	Sep 21, 2023		Soil	M23-Se0065298	X		
82	MW02_4.0	Sep 21, 2023		Soil	M23-Se0065299	X		
83	MW03_PAVER	Sep 21, 2023		Soil	M23-Se0065300	X		
84	MW03_0.1	Sep 21, 2023		Soil	M23-Se0065301	X		
85	MW03_1.0	Sep 21, 2023		Soil	M23-Se0065302	X		
86	MW03_1.5	Sep 21, 2023		Soil	M23-Se0065303	X		
87	MW03_2.0	Sep 21, 2023		Soil	M23-Se0065304	X		
88	MW03_2.5	Sep 21, 2023		Soil	M23-Se0065305	X		
89	MW03_3.0	Sep 21, 2023		Soil	M23-Se0065306	X		
90	MW03_4.0	Sep 21, 2023		Soil	M23-Se0065307	X		
91	FD01	Sep 20, 2023		Soil	M23-Se0065308	X		
92	FS01	Sep 20, 2023		Soil	M23-Se0065309	X		

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Sample Detail						HOLD	Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
93	FD03	Sep 20, 2023		Soil	M23-Se0065310	X		
94	FS03	Sep 20, 2023		Soil	M23-Se0065311	X		
95	FD04	Sep 20, 2023		Soil	M23-Se0065312	X		
96	FS04	Sep 20, 2023		Soil	M23-Se0065313	X		
97	FD07	Sep 21, 2023		Soil	M23-Se0065314	X		
98	FS07	Sep 21, 2023		Soil	M23-Se0065315	X		
99	MW01_PAVER	Sep 21, 2023		Soil	M23-Se0065316	X		
Test Counts						68	28	31

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	82			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	71			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	79			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	77			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	90			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	83			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	80			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	87			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	81			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	81			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	82			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	82			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	87			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	80			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	%	79			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	%	81			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	76			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	86			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	71			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	91			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	76			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	69			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	82			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	64			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	78			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	87			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	75			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	%	81			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	88			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	74			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorooctanesulfonic acid (PFOS)	M23-Se0067322	NCP	%	80			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M23-Se0065228	CP	%	81			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0065228	CP	%	124			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0065228	CP	%	78			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0065228	CP	%	84			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0065228	CP	%	89			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0065228	CP	%	89			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0065228	CP	%	90			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0065228	CP	%	96			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0065228	CP	%	114			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Se0065228	CP	%	82			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0065228	CP	%	85			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0065228	CP	%	84			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0065228	CP	%	89			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0065228	CP	%	109			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0065228	CP	%	97			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0065228	CP	%	78			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Se0065228	CP	%	65			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0065228	CP	%	71			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0065228	CP	%	58			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0065228	CP	%	76			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0065228	CP	%	77			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0065228	CP	%	67			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0065228	CP	%	82			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0065228	CP	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0065228	CP	%	68			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0065228	CP	%	66			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M23-Se0065233	CP	%	84			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0065233	CP	%	74			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0065233	CP	%	83			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0065233	CP	%	75			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0065233	CP	%	89			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0065233	CP	%	89			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0065233	CP	%	81			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0065233	CP	%	80			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0065233	CP	%	84			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0065233	CP	%	87			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0065233	CP	%	97			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Se0065233	CP	%	84			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0065233	CP	%	86			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0065233	CP	%	83			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0065233	CP	%	77			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0065233	CP	%	84			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0065233	CP	%	86			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0065233	CP	%	87			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Se0065233	CP	%	70			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0065233	CP	%	106			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0065233	CP	%	79			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0065233	CP	%	70			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0065233	CP	%	103			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0065233	CP	%	73			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0065233	CP	%	79			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0065233	CP	%	78			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0065233	CP	%	85			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0065233	CP	%	88			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0065233	CP	%	86			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M23-Se0065238	CP	%	80			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0065238	CP	%	66			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0065238	CP	%	108			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0065238	CP	%	81			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0065238	CP	%	87			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0065238	CP	%	83			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0065238	CP	%	85			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0065238	CP	%	87			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0065238	CP	%	84			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0065238	CP	%	76			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0065238	CP	%	86			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Se0065238	CP	%	86			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0065238	CP	%	89			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0065238	CP	%	79			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0065238	CP	%	78			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0065238	CP	%	83			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0065238	CP	%	81			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0065238	CP	%	84			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Se0065238	CP	%	65			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0065238	CP	%	109			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0065238	CP	%	79			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0065238	CP	%	68			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0065238	CP	%	108			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0065238	CP	%	99			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0065238	CP	%	63			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0065238	CP	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0065238	CP	%	85			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0065238	CP	%	75			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	M23-Se0065227	CP	%	23	27	15	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorohexanoic acid (PFHxA)	M23-Se0065227	CP	ug/kg	200	280	30	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0065227	CP	ug/kg	18	19	5.5	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0065227	CP	ug/kg	29	24	17	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0065227	CP	ug/kg	67	53	22	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0065227	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0065227	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Se0065227	CP	ug/kg	100	160	41	30%	Fail	Q15
Perfluorononanesulfonic acid (PFNS)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0065227	CP	ug/kg	34	51	42	30%	Fail	Q15
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0065227	CP	ug/kg	95	120	25	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0065227	CP	ug/kg	24	20	19	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0065227	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0065227	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0065232	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0065232	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0065232	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0065232	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	M23-Se0065237	CP	%	6.4	7.8	20	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0065237	CP	ug/kg	7.0	6.0	16	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0065237	CP	ug/kg	5.4	< 5	16	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorotridecanoic acid (PFTrDA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0065237	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0065237	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0065237	CP	ug/kg	33	29	15	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Se0065237	CP	ug/kg	100	91	11	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0065237	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0065237	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	M23-Se0065239	CP	%	7.6	6.3	19	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorononanoic acid (PFNA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanoic acid (PFDA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0065239	CP	ug/kg	< 10	< 10	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0065239	CP	ug/kg	< 10	< 10	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	M23-Se0065239	CP	ug/kg	190	180	4.1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0065239	CP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0065239	CP	ug/kg	< 5	< 5	<1	30%	Pass

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0065247	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0065247	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0065247	CP	ug/kg	7.0	11	41	30%	Fail	Q15
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0065247	CP	ug/kg	11	12	6.5	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0065247	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0065247	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Amy Meunier	Analytical Services Manager
Joseph Edouard	Senior Analyst-PFAS

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote 230726GHDS

Project Number 12616607	**Laboratory** Eurofins
Project Name MFS Port Pirie DSI	**Laboratory Address** 6 Monterey Road, Dandenong VIC 3175
GHD Project Manager Tom Duncan	**Laboratory Contact** Amy Meunier
GHD Contact Josh Anderson	
GHD PM email Tom.Duncan@ghd.com	**GHD Contact email** Josh.Anderson2@ghd.com

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludg W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO Envirolab	SAMPLE COMMENTS
MW01	28-Sep-23		GW	Ice	P	2		X			
MW02	28-Sep-23		GW	Ice	P	2		X			
MW03	28-Sep-23		GW	Ice	P	2		X			
RB01	28-Sep-23		GW	Ice	P	2		X			
FD01	28-Sep-23		GW	Ice	P	2		X			
FS01	28-Sep-23		GW	Ice	P	2		X		X	Please forward to envirolab

TOTAL NUMBER OF SAMPLES	
TOTAL NUMBER OF ESKIES	

CUSTODY DETAILS

SAMPLER	Date/Time		
GHD SERVICE CENTRE		Relinquished by	Date/Time
Received by:	Date/Time		
COURIER		Relinquished by	Date/Time
Received by Courier:	Date/Time		
LABORATORY		Relinquished by	Date/Time
Received by Lab:	Date/Time		

#1031201
3/10/23

COPY 4

GHD

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote 230726GHDS

Project Number 12618807	**Laboratory** Eurofins
Project Name MFS Port Pirie DSI	**Laboratory Address** 6 Monterey Road, Dandenong VIC 3175
GHD Project Manager Tom Duncan	**Laboratory Contact** Amy Maurer
GHD Contact Josh Anderson	
GHD PM email Tom.Duncan@ghd.com	**GHD Contact email** Josh.Anderson2@ghd.com

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format

Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO Envirolab	SAMPLE COMMENTS
MW01	28-Sep-23		GW	Ice	P	2		X			
MW02	28-Sep-23		GW	Ice	P	2		X			
MW03	28-Sep-23		GW	Ice	P	2		X			
RB01	28-Sep-23		GW	Ice	P	2		X			
FD01	28-Sep-23		GW	Ice	P	2		X			
FS01	28-Sep-23		GW	Ice	P	2		X			
										X	Please forward to envirolab

TOTAL NUMBER OF SAMPLES

TOTAL NUMBER OF ESKIES

CUSTODY DETAILS

SAMPLER			
GHD SERVICE CENTRE	Date/Time		
Received by:	Date/Time	Relinquished by:	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by:	Date/Time
LABORATORY			
Received by Lab:	Date/Time	Relinquished by:	Date/Time

#1031201
3/10/23

Tyrone Gowans

From: Amy Meunier
Sent: Tuesday, 3 October 2023 2:49 PM
To: #AU_CAU001_EnviroSampleVic
Subject: FW: 12616805 12616806 12616807 COCs

Follow Up Flag: Follow up
Flag Status: Completed

Hi Tyrone – Please see note below regarding the split sample

Kind regards,

Amy Meunier

Analytical Services Manager
Mobile : +61 477 574 867
Email : AmyMeunier@eurofins.com

Eurofins
6 Monterey Road,
Dandenong VIC 3175
Australia

My office hours are 9am to 5:30pm (Monday to Friday)
If you require sample receipt outside these hours please email envirosamplevic@eurofins.com

From: Tom Duncan <Thomas.Duncan@ghd.com>
Sent: Tuesday, 3 October 2023 2:07 PM
To: Ally Kirkman <Ally.Kirkman@ghd.com>; Amy Meunier <AmyMeunier@eurofins.com>
Cc: Ben Petticrew <Ben.Petticrew@ghd.com>
Subject: RE: 12616805 12616806 12616807 COCs

Hi Amy,

Please note that sample FS01 for the 12616805 (Port Augusta) will also need to be forwarded to Envirolab for analysis

Thanks

#103/201
3/10/23

Tom Duncan (he/him)
B. Engineering (Environmental) (Hons)
Senior Environmental Engineer

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PROJECT INFORMATION

Date Received: ~~29~~ 29/09/2023

Company: GHD

Contact person: Tom Duncan

Contact Number: 0413476581

Contact E-mail: thomas.Duncan@ghd.com

Project Name/site: Port Augusta GME, Port Pirie GME, Peterborough GME - MFS

Project Number: Port Pirie - 12616807
Port Augusta - 12616805
Peterborough - 12616806

COC: Attached ☐
E-mailed ☐
Not received ☐

17.0°C
−0.3°C
16.7°C on IB.

#1031199
3/10/23

Last modified on: 16 October 2019	Approved on: 16 October 2019	Version: QS1039_R2
Last modified by: H. Le	Approver: M. Makarios	Page 1 of 1
Editorial Committee: T. Lakeland, F. Sanjaya, H. Le, M. Makarios		Next required review date: 16 October 2022

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www.eurofins.com.au EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377
Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rorke Road	43 Detroit Drive	1277 Cameron Road,
Penrose,	Rolleston,	Gate Pa,
Auckland 1061	Christchurch 7675	Tauranga 3112
Tel: +64 9 526 4551	Tel: +64 3 343 5201	Tel: +64 9 525 0568
IANZ# 1327	IANZ# 1290	IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd SA
Contact name:	Tom Duncan
Project name:	MFS PORT PIRIE DSI
Project ID:	12616807
Turnaround time:	5 Day
Date/Time received	Oct 3, 2023 2:07 PM
Eurofins reference	1031201

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✓	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Amy Meunier on phone : or by email: AmyMeunier@eurofins.com

Results will be delivered electronically via email to Tom Duncan - tom.duncan@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd SA email address.

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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IANZ# 1327	IANZ# 1290	IANZ# 1402

Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS PORT PIRIE DSI
Project ID: 12616807

Order No.:
Report #: 1031201
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Oct 3, 2023 2:07 PM
Due: Oct 10, 2023
Priority: 5 Day
Contact Name: Tom Duncan

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	MW01	Sep 28, 2023		Water	M23-Oc0004473	X
2	MW02	Sep 28, 2023		Water	M23-Oc0004474	X
3	MW03	Sep 28, 2023		Water	M23-Oc0004475	X
4	RB01	Sep 28, 2023		Water	M23-Oc0004476	X
5	FD01	Sep 28, 2023		Water	M23-Oc0004477	X
Test Counts						5

GHD Pty Ltd
GPO Box 2052
Adelaide
SA 5001

Attention: **Tom Duncan**

Report **1031201-W**
Project name MFS PORT PIRIE DSI
Project ID 12616807
Received Date Oct 03, 2023

Client Sample ID			[R16]MW01	MW02	MW03	RB01
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M23-Oc0004473	M23-Oc0004474	M23-Oc0004475	M23-Oc0004476
Date Sampled			Sep 28, 2023	Sep 28, 2023	Sep 28, 2023	Sep 28, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	3.4	0.32	1.0	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	6.5	0.70	1.8	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	33	3.5	8.0	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	[N09]3.2	[N09]0.35	[N09]0.79	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]7.2	[N09]0.74	[N09]1.7	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	[N09]1.4	< 0.1	[N09]0.16	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	113	113	113	71
13C5-PFPeA (surr.)	1	%	123	124	123	108
13C5-PFHxA (surr.)	1	%	126	126	125	110
13C4-PFHpA (surr.)	1	%	122	123	124	104
13C8-PFOA (surr.)	1	%	118	120	120	116
13C5-PFNA (surr.)	1	%	116	115	75	101
13C6-PFDA (surr.)	1	%	12	54	47	123
13C2-PFUnDA (surr.)	1	%	143	93	107	110
13C2-PFDoDA (surr.)	1	%	123	86	93	98
13C2-PFTeDA (surr.)	1	%	80	52	55	46
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	98	93	93	90
D3-N-MeFOSA (surr.)	1	%	109	81	91	93

Client Sample ID			[R16]MW01	MW02	MW03	RB01
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M23-Oc0004473	M23-Oc0004474	M23-Oc0004475	M23-Oc0004476
Date Sampled			Sep 28, 2023	Sep 28, 2023	Sep 28, 2023	Sep 28, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
D5-N-EtFOSA (surr.)	1	%	120	88	101	102
D7-N-MeFOSE (surr.)	1	%	110	81	87	89
D9-N-EtFOSE (surr.)	1	%	91	73	81	86
D5-N-EtFOSAA (surr.)	1	%	82	50	57	79
D3-N-MeFOSAA (surr.)	1	%	88	57	65	81
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	[N09]21	[N09]2.5	[N09]7.0	< 0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 1	< 0.1	< 0.1	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	8.1	0.92	2.9	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	[N09]16	[N09]2.0	[N09]5.6	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]160	[N09]17	[N09]37	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	[N09]9.4	[N09]0.88	[N09]1.8	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]240	[N09]17	[N09]30	< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 1	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	116	117	118	105
18O2-PFHxS (surr.)	1	%	113	114	114	96
13C8-PFOS (surr.)	1	%	117	120	124	92
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	0.05	ug/L	< 1	< 0.05	0.28	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 1	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	75	112	83	101
13C2-6:2 FTSA (surr.)	1	%	122	70	65	93
13C2-8:2 FTSA (surr.)	1	%	152	57	54	79
13C2-10:2 FTSA (surr.)	1	%	93	64	74	74
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	400	34	67	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	247.2	17.74	31.7	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	407.2	34.74	68.7	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	474.3	42.11	87.57	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	509.2	45.91	98.03	< 0.1

Client Sample ID			FD01
Sample Matrix			Water
Eurofins Sample No.			M23-Oc0004477
Date Sampled			Sep 28, 2023
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	0.27
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.59
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	2.9
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	[N09]0.29
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]0.58

Client Sample ID			FD01
Sample Matrix			Water
Eurofins Sample No.			M23-Oc0004477
Date Sampled			Sep 28, 2023
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	[N09]0.11
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	121
13C5-PFPeA (surr.)	1	%	141
13C5-PFHxA (surr.)	1	%	139
13C4-PFHpA (surr.)	1	%	136
13C8-PFOA (surr.)	1	%	134
13C5-PFNA (surr.)	1	%	96
13C6-PFDA (surr.)	1	%	74
13C2-PFUnDA (surr.)	1	%	113
13C2-PFDoDA (surr.)	1	%	105
13C2-PFTeDA (surr.)	1	%	71
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	96
D3-N-MeFOSA (surr.)	1	%	84
D5-N-EtFOSA (surr.)	1	%	89
D7-N-MeFOSE (surr.)	1	%	80
D9-N-EtFOSE (surr.)	1	%	75
D5-N-EtFOSAA (surr.)	1	%	73
D3-N-MeFOSAA (surr.)	1	%	76
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	[N09]2.0
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.1
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	0.82
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	[N09]1.6
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]13
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	[N09]0.62
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]12
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	128
18O2-PFHxS (surr.)	1	%	131
13C8-PFOS (surr.)	1	%	145

Client Sample ID			FD01
Sample Matrix			Water
Eurofins Sample No.			M23-Oc0004477
Date Sampled			Sep 28, 2023
Test/Reference	LOR	Unit	
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01
13C2-4:2 FTSA (surr.)	1	%	113
13C2-6:2 FTSA (surr.)	1	%	86
13C2-8:2 FTSA (surr.)	1	%	70
13C2-10:2 FTSA (surr.)	1	%	76
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	25
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	12.58
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	25.58
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	31.63
Sum of PFASs (n=30)*	0.1	ug/L	34.78

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	Oct 04, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	Oct 04, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	Oct 04, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	Oct 04, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	Oct 03, 2023	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Eurofins Environment Testing Australia Pty Ltd
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Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS PORT PIRIE DSI
Project ID: 12616807

Order No.:
Report #: 1031201
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Oct 3, 2023 2:07 PM
Due: Oct 10, 2023
Priority: 5 Day
Contact Name: Tom Duncan

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	MW01	Sep 28, 2023		Water	M23-Oc0004473	X
2	MW02	Sep 28, 2023		Water	M23-Oc0004474	X
3	MW03	Sep 28, 2023		Water	M23-Oc0004475	X
4	RB01	Sep 28, 2023		Water	M23-Oc0004476	X
5	FD01	Sep 28, 2023		Water	M23-Oc0004477	X
Test Counts						5

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	69			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	64			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	71			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	59			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	56			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	52			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	78			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	69			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	82			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	61			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	82			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	98			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	80			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	108			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	%	82			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	%	76			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	78			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	78			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	74			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	74			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	78			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	62			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	63			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	70			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	65			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	54			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	75			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	%	79			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	73			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	76			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M23-Oc0001079	NCP	%	77			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Oc0004441	NCP	%	73			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0068009	NCP	%	128			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Oc0008822	NCP	%	68			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Oc0008822	NCP	%	67			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-Oc0008822	NCP	%	64			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0068009	NCP	%	83			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0068009	NCP	%	70			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0068009	NCP	%	81			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0068009	NCP	%	57			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0068009	NCP	%	80			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Se0068009	NCP	%	104			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0068009	NCP	%	80			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0068009	NCP	%	119			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0068009	NCP	%	75			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0068009	NCP	%	76			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0068009	NCP	%	76			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0068009	NCP	%	87			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Oc0008822	NCP	%	77			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0068009	NCP	%	74			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Oc0008822	NCP	%	70			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Oc0008822	NCP	%	68			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Oc0008822	NCP	%	69			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0068009	NCP	%	88			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Oc0001079	NCP	%	59			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0068009	NCP	%	61			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0068009	NCP	%	81			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Oc0008822	NCP	%	87			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Oc0008822	NCP	%	80			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0068009	NCP	%	76			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorononanoic acid (PFNA)	M23-Oc0004477	CP	ug/L	0.11	0.11	3.1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Oc0004477	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Oc0004477	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Oc0004477	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Oc0004477	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Oc0004477	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Oc0004477	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Oc0004477	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorodecanesulfonic acid (PFDS)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Oc0004477	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Oc0004477	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
R16	The LORs have been raised due to the high concentration of one or more analytes

Authorised by:

Amy Meunier	Analytical Services Manager
Joseph Edouard	Senior Analyst-PFAS

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

COPY 4

GHD

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address
Level 4 - 211 Victoria Square, Adelaide SA 5000
Telephone: (08) 8111 6600

Completion Date / Turnaround
STANDARD

Quote #
Quote 230726GHDS

Project Number 12616607
Project Name MFS Port Pirie DSI
GHD Project Manager Tom Duncan
GHD Contact Josh Anderson
GHD PM email Tom.Duncan@ghd.com
GHD Contact email Josh.Anderson2@ghd.com

Laboratory Eurofins
Laboratory Address 6 Monterey Road, Dandenong VIC 3175
Laboratory Contact Amy Meunier

COURIER AND LABORATORY INSTRUCTIONS:
- Sign chain of custody document on reciept and release of samples, between each party
- Samples are to be delivered to the laboratory address shown
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested
- All results should reference the Job Number and Project Name
- All results should be provided in NATA accredited pdf format and ESDAT format

	Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Number	Volume (ml)	PFAS Full 30 Analyte Suite	HOLD	SEND TO Envirolab	SAMPLE COMMENTS
	MW01	28-Sep-23		GW	Ice	P	2		X			
	MW02	28-Sep-23		GW	Ice	P	2		X			
	MW03	28-Sep-23		GW	Ice	P	2		X			
	RB01	28-Sep-23		GW	Ice	P	2		X			
	FD01	28-Sep-23		GW	Ice	P	2		X			
1	FS01	28-Sep-23		GW	Ice	P	2		X		X	Please forward to envirolab

TOTAL NUMBER OF SAMPLES
TOTAL NUMBER OF ESKIES

CUSTODY DETAILS

SAMPLER	Date/Time	Relinquished by: Matthew A	Date/Time 4/10/23 8am
GHD SERVICE CENTRE Received by:	Date/Time	Relinquished by:	Date/Time
COURIER Received by Courier:	Date/Time	Relinquished by:	Date/Time
LABORATORY Received by Lab:	Date/Time		

ENVIROLAB GROUP
Envirolab Services
25 Research Drive
Croydon South VIC 3136
Ph: (03) 9763 2500

Job No. 39939
Date Received 4/10/23
Time Received 12:40pm
Received By: AG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

5.7°C

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Tom Duncan

Sample Login Details

Your reference	12616807
Envirolab Reference	39939
Date Sample Received	04/10/2023
Date Instructions Received	04/10/2023
Date Results Expected to be Reported	11/10/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	5.7
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	PFAS in Waters Extended
FS01	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 39939

Client Details

Client	GHD SA
Attention	Tom Duncan
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12616807**
Number of Samples	1 Water
Date samples received	04/10/2023
Date completed instructions received	04/10/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	11/10/2023
Date of Issue	10/10/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Azrin Akram, Senior Chemist

Authorised By
Pamela Adams, Laboratory Manager

PFAS in Waters Extended		
Our Reference		39939-1
Your Reference	UNITS	FS01
Date Sampled		28/09/2023
Type of sample		Water
Date prepared	-	06/10/2023
Date analysed	-	06/10/2023
Perfluorobutanesulfonic acid	µg/L	3.4
Perfluoropentanesulfonic acid	µg/L	4.2
Perfluorohexanesulfonic acid PFHxS	µg/L	28
Perfluoroheptanesulfonic acid	µg/L	2.1
Perfluorooctanesulfonic acid PFOS	µg/L	24
Perfluorodecanesulfonic acid	µg/L	<0.02
Perfluorobutanoic acid	µg/L	0.61
Perfluoropentanoic acid	µg/L	1.1
Perfluorohexanoic acid	µg/L	5.5
Perfluoroheptanoic acid	µg/L	0.62
Perfluorooctanoic acid PFOA	µg/L	1.5
Perfluorononanoic acid	µg/L	0.21
Perfluorodecanoic acid	µg/L	<0.02
Perfluoroundecanoic acid	µg/L	<0.02
Perfluorododecanoic acid	µg/L	<0.05
Perfluorotridecanoic acid	µg/L	<0.1
Perfluorotetradecanoic acid	µg/L	<0.5
4:2 FTS	µg/L	<0.01
6:2 FTS	µg/L	0.03
8:2 FTS	µg/L	<0.02
10:2 FTS	µg/L	<0.02
Perfluorooctane sulfonamide	µg/L	<0.1
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05
N-Ethyl perfluorooctanesulfon -amide	µg/L	<0.1
N-Me perfluorooctanesulfonamid -oethanol	µg/L	<0.05
N-Et perfluorooctanesulfonamid -oethanol	µg/L	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.02
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.02
Surrogate $^{13}C_8$ PFOS	%	97
Surrogate $^{13}C_2$ PFOA	%	102
Extracted ISTD $^{13}C_3$ *PFBS*	%	75
Extracted ISTD $^{18}O_2$ *PFHxS*	%	97
Extracted ISTD $^{13}C_4$ *PFOS*	%	100
Extracted ISTD $^{13}C_4$ *PFBA*	%	90

PFAS in Waters Extended		
Our Reference		39939-1
Your Reference	UNITS	FS01
Date Sampled		28/09/2023
Type of sample		Water
Extracted ISTD $^{13}C_3$ *PFPeA*	%	91
Extracted ISTD $^{13}C_2$ *PFHxA*	%	93
Extracted ISTD $^{13}C_4$ *PFHpA*	%	94
Extracted ISTD $^{13}C_4$ *PFOA*	%	77
Extracted ISTD $^{13}C_5$ *PFNA*	%	60
Extracted ISTD $^{13}C_2$ *PFDA*	%	77
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	78
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	80
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	81
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	56
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	52
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	56
Extracted ISTD $^{13}C_8$ *FOSA*	%	86
Extracted ISTD d_3 *N MeFOSA*	%	85
Extracted ISTD d_5 *NEtFOSA*	%	83
Extracted ISTD d_7 *N MeFOSE*	%	92
Extracted ISTD d_9 *N EtFOSE*	%	93
Extracted ISTD d_3 *N MeFOSAA*	%	86
Extracted ISTD d_5 *N EtFOSAA*	%	79
Total Positive PFHxS & PFOS	µg/L	52
Total Positive PFOS & PFOA	µg/L	25
Total Positive PFAS	µg/L	71

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.4 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Waters Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorobutanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	126	[NT]
Perfluoropentanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	122	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	127	[NT]
Perfluoroheptanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	130	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	121	[NT]
Perfluorodecanesulfonic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	113	[NT]
Perfluorobutanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	121	[NT]
Perfluoropentanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	124	[NT]
Perfluorohexanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	121	[NT]
Perfluoroheptanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	123	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	120	[NT]
Perfluorononanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	120	[NT]
Perfluorodecanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	125	[NT]
Perfluoroundecanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	113	[NT]
Perfluorododecanoic acid	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	121	[NT]
Perfluorotridecanoic acid	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	126	[NT]
Perfluorotetradecanoic acid	µg/L	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	119	[NT]
4:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	123	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	115	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	120	[NT]
10:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	127	[NT]
Perfluorooctane sulfonamide	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	117	[NT]
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	110	[NT]
N-Ethyl perfluorooctanesulfon -amide	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	111	[NT]
N-Me perfluorooctanesulfonamid -oethanol	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	137	[NT]
N-Et perfluorooctanesulfonamid -oethanol	µg/L	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	123	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	138	[NT]
EtPerfluorooctanesulf- amid oacetic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	125	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	105	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	100	[NT]
Extracted ISTD $^{13}C_3$ PFBS	%		Org-029	81	[NT]	[NT]	[NT]	[NT]	80	[NT]

QUALITY CONTROL: PFAS in Waters Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	81	[NT]	[NT]	[NT]	[NT]	83	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	83	[NT]	[NT]	[NT]	[NT]	84	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	92	[NT]	[NT]	[NT]	[NT]	81	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	81	[NT]	[NT]	[NT]	[NT]	81	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	79	[NT]	[NT]	[NT]	[NT]	82	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	82	[NT]	[NT]	[NT]	[NT]	81	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	88	[NT]	[NT]	[NT]	[NT]	83	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	85	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	87	[NT]	[NT]	[NT]	[NT]	82	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	88	[NT]	[NT]	[NT]	[NT]	82	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	89	[NT]	[NT]	[NT]	[NT]	81	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	78	[NT]	[NT]	[NT]	[NT]	77	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	83	[NT]	[NT]	[NT]	[NT]	84	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	93	[NT]	[NT]	[NT]	[NT]	94	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	92	[NT]	[NT]	[NT]	[NT]	86	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	88	[NT]	[NT]	[NT]	[NT]	95	[NT]
Extracted ISTD d_5 *NEtFOSA*	%		Org-029	85	[NT]	[NT]	[NT]	[NT]	87	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: PFAS in Waters Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	84	[NT]	[NT]	[NT]	[NT]	81	[NT]
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	83	[NT]	[NT]	[NT]	[NT]	79	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

14 EG

Environmental Division
Melbourne
Work Order Reference
EM2317440

RX 4166

COPY

Telephone : + 61-3-8549 9600

GHD

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address
Level 4 - 211 Victoria Square, Adelaide SA 5000
Telephone: (08) 8111 6600

Completion Date / Turnaround
STANDARD

Quote #
Quote GHD STANDARD RATES

Project Number 12616807	**Laboratory** Eurofins Environmental
Project Name MFS Port Pirie DSI	**Laboratory Address** 9 Main Terrace, Richmond SA 5033
GHD Project Manager Tom Duncan	**Laboratory Contact** Parimal Acharya
GHD Contact Ally Kirkman	
GHD PM email Tom.Duncan@ghd.com	**GHD Contact email** Ally.Kirkman@ghd.com

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (Via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format.

	Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil, SL: Sludge W: Water, A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar, B: bag, V: vial, O: glass bottle, P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO ALS	SAMPLE COMMENTS
	FD01	20-Sep-23		Soil	Ice	J	1			X		
	FS01	20-Sep-23		Soil	Ice	J	1			X		
	FD02	20-Sep-23		Soil	Ice	J	1		X			
1	FS02	20-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
	FD03	20-Sep-23		Soil	Ice	J	1			X		
	FS03	20-Sep-23		Soil	Ice	J	1			X		
	FD04	20-Sep-23		Soil	Ice	J	1			X		
	FS04	20-Sep-23		Soil	Ice	J	1			X		
	FD05	21-Sep-23		Soil	Ice	J	1		X			
2	FS05	21-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
	FD06	21-Sep-23		Soil	Ice	J	1		X			
3	FS06	21-Sep-23		Soil	Ice	J	1				X	Please forward to ALS for analysis
	FD07	21-Sep-23		Soil	Ice	J	1			X		
	FS07	21-Sep-23		Soil	Ice	J	1			X		

TOTAL NUMBER OF SAMPLES	111
TOTAL NUMBER OF ESKIES	2

CUSTODY DETAILS

SAMPLER	Date/Time		
GHD SERVICE CENTRE Received by: 70	Date/Time 28/9 11:06	Relinquished by:	Date/Time
COURIER Received by Courier:	Date/Time	Relinquished by:	Date/Time
LABORATORY Received by Lab:	Date/Time	Relinquished by:	Date/Time

Relinquished by Jessica-S EG: 28/9/23 8am

Ranil Weerakkody

From: Tom Duncan <Thomas.Duncan@ghd.com>
Sent: Wednesday, 4 October 2023 10:09 AM
To: Peter Ravlic
Cc: Ally Kirkman
Subject: [EXTERNAL] - RE: EM2317440 - GHDSER - 12616807

Hi Peter,

These ones will be for the PFAS full suite as well.

Thanks

Tom Duncan (he/him)
B. Engineering (Environmental) (Hons)
Senior Environmental Engineer

GHD
Proudly employee-owned | ghd.com
Level 9, 180 Lonsdale Street, Melbourne, VIC 3000
D 61 0 8687 8327 **M** 61 413 476 581 **E** Tom.Duncan@ghd.com

The Power of Commitment
Connect

From: Peter Ravlic <peter.ravlic@alsglobal.com>
Sent: Tuesday, October 3, 2023 6:01 PM
To: Tom Duncan <Thomas.Duncan@ghd.com>
Subject: EM2317440 - GHDSER - 12616807

Hi Tom

Can you please confirm analysis for above hold samples

Thanks

Kind Regards

right solutions.
right partner.

Peter Ravlic
Client Services
ALS Limited

Ph: +61 3 8549 9600
peter.ravlic@alsglobal.com

2-4 Westall Road, Springvale VIC 3171

alsglobal.com

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM2317440**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: TOM DUNCAN	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: tom.duncan@ghd.com	E-mail	: peter.ravlic@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9645
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: 12616807	Page	: 1 of 2
Order number	: ----	Quote number	: EB2020GHDSER0038 (EN/000)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	:		

Dates

Date Samples Received	: 28-Sep-2023 10:30	Issue Date	: 04-Oct-2023
Client Requested Due Date	: 11-Oct-2023	Scheduled Reporting Date	: **11-Oct-2023**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 6.5°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EM2317440-001	20-Sep-2023 00:00	FS02	✓	✓
EM2317440-002	21-Sep-2023 00:00	FS05	✓	✓
EM2317440-003	21-Sep-2023 00:00	FS06	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com
ALLY KIRKMAN		
- *AU Certificate of Analysis - NATA (COA)	Email	ally.kirkman@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ally.kirkman@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ally.kirkman@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ally.kirkman@ghd.com
- Chain of Custody (CoC) (COC)	Email	ally.kirkman@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ally.kirkman@ghd.com
- EDI Format - XTab (XTAB)	Email	ally.kirkman@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ally.kirkman@ghd.com
GHD LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	ghdlabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ghdlabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ghdlabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ghdlabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ghdlabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ghdlabreports@ghd.com
TOM DUNCAN		
- *AU Certificate of Analysis - NATA (COA)	Email	tom.duncan@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	tom.duncan@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	tom.duncan@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	tom.duncan@ghd.com
- A4 - AU Tax Invoice (INV)	Email	tom.duncan@ghd.com
- Chain of Custody (CoC) (COC)	Email	tom.duncan@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	tom.duncan@ghd.com
- EDI Format - XTab (XTAB)	Email	tom.duncan@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	tom.duncan@ghd.com

QUALITY CONTROL REPORT

Work Order	: **EM2317440**	Page	: 1 of 7
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: TOM DUNCAN	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: 12616807	Date Samples Received	: 28-Sep-2023
Order number	: ----	Date Analysis Commenced	: 04-Oct-2023
C-O-C number	: ----	Issue Date	: 10-Oct-2023
Sampler	: ----		
Site	:		
Quote number	: EN/000		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Arenie Vijayaratnam	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Inorganics, Springvale, VIC
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General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5337926)									
EM2317440-001	FS02	EA055: Moisture Content	----	0.1	%	23.6	25.1	6.1	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5340227)									
EM2317396-024	Anonymous	EA055: Moisture Content	----	0.1	%	23.7	26.0	9.5	0% - 20%
EM2317396-036	Anonymous	EA055: Moisture Content	----	0.1	%	41.4	37.6	9.6	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5342786)									
EM2317440-001	FS02	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.110	0.0936	16.6	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0914	0.0855	6.7	0% - 20%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.384	0.391	1.7	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0298	0.0302	1.0	0% - 20%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	1.62	1.79	10.1	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0004	<0.0004	0.0	No Limit
EM2317495-024	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0049	0.0056	12.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0048	0.0051	5.5	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.108	0.114	5.5	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0248	0.0340	31.4	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	88.0	# 129	38.1	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.633	0.887	33.3	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5342786)									
EM2317440-001	FS02	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0524	0.0432	19.2	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.237	0.194	19.7	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0178	0.0163	8.7	0% - 20%
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0258	0.0247	4.6	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0506	0.0501	1.0	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5342786) - continued									
EM2317440-001	FS02	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0013	0.0015	16.2	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	0.024	0.020	18.7	0% - 20%
EM2317495-024	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0082	0.0090	10.2	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0239	0.0251	4.8	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0136	0.0146	6.8	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0351	0.0403	13.8	0% - 50%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0404	0.0666	49.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.648	# 0.868	29.1	0% - 20%
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.732	# 1.01	31.9	0% - 20%
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.466	# 0.624	29.0	0% - 20%
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	0.205	# 0.267	26.1	0% - 20%
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	0.0940	0.124	27.3	0% - 50%
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.017	<0.018	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5342786)									
EM2317440-001	FS02	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0003	0.0003	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2317495-024	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	1.24	# 1.82	38.1	0% - 20%
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	0.0210	0.0313	39.3	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0035	0.0036	4.5	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	0.0152	0.0228	40.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0086	<0.0090	3.7	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5342786) - continued									
EM2317495-024	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0086	<0.0090	3.7	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0086	<0.0090	3.7	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5342786)									
EM2317440-001	FS02	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	0.0031	0.0029	7.4	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2317495-024	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0035	<0.0036	3.7	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0035	<0.0036	3.7	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	6.70	# 10.8	47.0	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	0.300	# 0.415	32.2	0% - 20%
EP231P: PFAS Sums (QC Lot: 5342786)									
EM2317440-001	FS02	EP231X: Sum of PFAS	----	0.0002	mg/kg	2.65	2.74	3.6	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	2.00	2.18	8.5	0% - 20%
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	2.47	2.58	4.0	0% - 20%
EM2317495-024	Anonymous	EP231X: Sum of PFAS	----	0.0002	mg/kg	99.3	# 146	38.2	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	88.1	# 129	37.8	0% - 20%
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	94.9	# 140	38.4	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5342786)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00111 mg/kg	88.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	97.2	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00114 mg/kg	97.9	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	107	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	97.7	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00121 mg/kg	91.6	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5342786)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	84.8	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.8	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.4	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.2	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.4	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	86.6	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5342786)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.6	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.8	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.3	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	84.0	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5342786)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5342786) - continued								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	93.5	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00119 mg/kg	92.9	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	94.7	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00121 mg/kg	99.6	70.0	130
EP231P: PFAS Sums (QCLot: 5342786)								
EP231X: Sum of PFAS	----	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5342786)							
EM2317440-002	FS05	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	83.6	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00118 mg/kg	90.2	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	95.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00119 mg/kg	97.9	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00121 mg/kg	# Not Determined	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5342786)							
EM2317440-002	FS05	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	84.0	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	90.5	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	97.5	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	97.7	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	93.3	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	89.4	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	87.2	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	88.0	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	74.5	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	131	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	87.3	69.0	133

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5342786)							
EM2317440-002	FS05	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	87.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	100	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	93.2	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	88.4	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	86.4	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	88.0	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	94.5	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5342786)							
EM2317440-002	FS05	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	94.1	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	90.7	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	78.0	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	# 31.1	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2317440**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: TOM DUNCAN	Telephone	: +6138549 9645
Project	: 12616807	Date Samples Received	: 28-Sep-2023
Site	:	Issue Date	: 10-Oct-2023
Sampler	: ----	No. of samples received	: 3
Order number	: ----	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP231A: Perfluoroalkyl Sulfonic Acids	EM2317495--024	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	38.1 %	0% - 20%	**RPD exceeds LOR based limits**
EP231B: Perfluoroalkyl Carboxylic Acids	EM2317495--024	Anonymous	**Perfluorodecanoic acid (PFDA)**	335-76-2	29.1 %	0% - 20%	**RPD exceeds LOR based limits**
EP231B: Perfluoroalkyl Carboxylic Acids	EM2317495--024	Anonymous	**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	31.9 %	0% - 20%	**RPD exceeds LOR based limits**
EP231B: Perfluoroalkyl Carboxylic Acids	EM2317495--024	Anonymous	**Perfluorododecanoic acid (PFDoDA)**	307-55-1	29.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP231B: Perfluoroalkyl Carboxylic Acids	EM2317495--024	Anonymous	**Perfluorotridecanoic acid (PFTrDA)**	72629-94-8	26.1 %	0% - 20%	**RPD exceeds LOR based limits**
EP231C: Perfluoroalkyl Sulfonamides	EM2317495--024	Anonymous	**Perfluorooctane sulfonamide (FOSA)**	754-91-6	38.1 %	0% - 20%	**RPD exceeds LOR based limits**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2317495--024	Anonymous	**8:2 Fluorotelomer sulfonic acid (8:2 FTS)**	39108-34-4	47.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2317495--024	Anonymous	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	32.2 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums	EM2317495--024	Anonymous	**Sum of PFAS**	----	38.2 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums	EM2317495--024	Anonymous	**Sum of PFHxS and PFOS**	355-46-4/1763-23-1	37.8 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums	EM2317495--024	Anonymous	**Sum of PFAS (WA DER List)**	----	38.4 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EM2317440--002	FS05	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EM2317440--002	FS05	**Perfluorodecane sulfonic acid (PFDS)**	335-77-3	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2317440--002	FS05	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	31.1 %	70.0-130%	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055) FS02	**20-Sep-2023**	**----**	----	**----**	**04-Oct-2023**	04-Oct-2023	✓
HDPE Soil Jar (EA055) FS05, FS06	**21-Sep-2023**	**----**	----	**----**	**05-Oct-2023**	05-Oct-2023	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) FS02	**20-Sep-2023**	**06-Oct-2023**	18-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
HDPE Soil Jar (EP231X) FS05, FS06	**21-Sep-2023**	**06-Oct-2023**	19-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) FS02	**20-Sep-2023**	**06-Oct-2023**	18-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
HDPE Soil Jar (EP231X) FS05, FS06	**21-Sep-2023**	**06-Oct-2023**	19-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) FS02	**20-Sep-2023**	**06-Oct-2023**	18-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
HDPE Soil Jar (EP231X) FS05, FS06	**21-Sep-2023**	**06-Oct-2023**	19-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) FS02	**20-Sep-2023**	**06-Oct-2023**	18-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
HDPE Soil Jar (EP231X) FS05, FS06	**21-Sep-2023**	**06-Oct-2023**	19-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) FS02	**20-Sep-2023**	**06-Oct-2023**	18-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓
HDPE Soil Jar (EP231X) FS05, FS06	**21-Sep-2023**	**06-Oct-2023**	19-Mar-2024	✓	**10-Oct-2023**	15-Nov-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	3	18	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

CERTIFICATE OF ANALYSIS

Work Order	: **EM2317440**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: TOM DUNCAN	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: 12616807	Date Samples Received	: 28-Sep-2023 10:30
Order number	: ----	Date Analysis Commenced	: 04-Oct-2023
C-O-C number	: ----	Issue Date	: 10-Oct-2023 17:09
Sampler	: ----		
Site	:		
Quote number	: EN/000		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Arenie Vijayaratnam	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231X: Poor matrix spike recovery for sample EM2317440-002 due to sample matrix interference. Confirmed by re-analysis.
- EP231X: Sample EM2317440-001 required dilution due to matrix interferences. LOR values have been adjusted accordingly.
- EP231X: Poor duplicate precision observed for sample EM2317495-024 due to sample heterogeneity. Confirmed sample heterogeneity via re-analysis.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	FS02	FS05	FS06	----	----
			Sampling date / time	20-Sep-2023 00:00	21-Sep-2023 00:00	21-Sep-2023 00:00	----	----
Compound	CAS Number	LOR	Unit	EM2317440-001	EM2317440-002	EM2317440-003	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**23.6**	**2.4**	**15.1**	**----**	**----**
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	**0.110**	**0.0005**	**0.0295**	**----**	**----**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	**0.0914**	<0.0002	**0.0321**	**----**	**----**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.384**	**0.0016**	**0.307**	**----**	**----**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	**0.0298**	<0.0002	**0.0220**	**----**	**----**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**1.62**	**0.0381**	**0.821**	**----**	**----**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0004	**0.0098**	<0.0002	**----**	**----**
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	**0.024**	<0.001	**0.006**	**----**	**----**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	**0.0524**	**0.0008**	**0.0155**	**----**	**----**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.237**	**0.0008**	**0.0927**	**----**	**----**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	**0.0178**	<0.0002	**0.0079**	**----**	**----**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	**0.0258**	**0.0006**	**0.0199**	**----**	**----**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	**0.0506**	**0.0004**	**0.0006**	**----**	**----**
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	**0.0005**	<0.0002	**----**	**----**
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	**0.0013**	**0.0007**	<0.0002	**----**	**----**
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	**0.0002**	<0.0002	**----**	**----**
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**----**	**----**
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	**----**	**----**
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	**0.0003**	<0.0002	<0.0002	**----**	**----**
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	**----**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	FS02	FS05	FS06	----	----
				Sampling date / time	20-Sep-2023 00:00	21-Sep-2023 00:00	21-Sep-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EM2317440-001	EM2317440-002	EM2317440-003	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		**0.0031**	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	**0.0006**	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**2.65**	**0.0546**	**1.35**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**2.00**	**0.0397**	**1.13**	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**2.47**	**0.0430**	**1.30**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**91.4**	**101**	**94.2**	----	----
13C8-PFOA	----	0.0002	%		**102**	**102**	**100**	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	68	136
13C8-PFOA	----	69	133

Appendix G

Tabulated Analytical Results

Appendix G
Table 1
Soil Results

SA Metropolitan Fire Station
Port Pirie Fire Station
MFS Port Pirie DSI

			PFAS - Perfluoroalkyl Sulfonic Acids							PFAS - Perfluoroalkyl Carboxylic Acids											
			Perfluoropropanesulfonic acid (PFPrS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.005	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002
PFAS NEMP 2.0 2020 Ecological direct exposure								1						10							
PFAS NEMP 2.0 2020 Ecological indirect exposure								0.14													
PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)						20		20						50							
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)						2		2						20							
SA MFS Site Specific Criteria - Metropolitan (Staffed)														50							
Date	**Field ID**	**Lab Report Number**																			
20 Sep 2023	BH01_0.1	1029918	< 0.005	< 0.005	< 0.005	0.044	0.0099	0.6	< 0.005	< 0.005	< 0.005	0.0059	< 0.005	0.0067	0.0050	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0063
	BH01_1.5	1029918	< 0.005	< 0.005	< 0.005	0.011	< 0.005	0.0094	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	BH02_0.1	1029918	< 0.005	< 0.005	< 0.005	0.0064	< 0.005	1.1	< 0.005	< 0.005	< 0.005	0.0074	< 0.005	< 0.005	< 0.005	< 0.005	0.013	< 0.005	< 0.005	< 0.005	< 0.005
	BH02_2.0	1029918	0.0072	0.021	0.023	0.24	0.012	0.19	< 0.005	< 0.005	< 0.005	0.031	< 0.005	0.013	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	BH03_0.5	1029918	0.0056	0.021	0.024	0.1	< 0.005	0.12	< 0.005	< 0.005	0.0060	0.05	0.012	0.0096	0.026	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	BH03_1.5	1029918	0.012	0.027	0.021	0.11	0.0055	0.11	< 0.005	< 0.005	0.0084	0.045	0.013	0.0081	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	BH04_0.5	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.059	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	BH04_2.0	1029918	< 0.005	< 0.005	< 0.005	0.0081	< 0.005	0.032	< 0.005	< 0.005	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	BH05_0.1	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.28	0.0065	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	BH05_1.0	1029918	0.034	0.1	0.095	0.53	0.024	1.4	< 0.005	0.02	0.036	0.2	0.018	0.029	0.067	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	FD02	1029918	0.043	0.13	0.086	0.26	0.013	0.92	< 0.005	0.025	0.048	0.22	0.013	0.016	0.037	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	FS02	EM2317440	-	0.110	0.0914	0.384	0.0298	1.62	< 0.0004	0.024	0.0524	0.237	0.0178	0.0258	0.0506	< 0.0002	0.0013	< 0.0002	< 0.0002	< 0.0005	0.0003
21 Sep 2023	MW01_0.5	1029918	< 0.005	< 0.005	< 0.005	0.033	< 0.005	0.1	< 0.005	< 0.005	< 0.005	0.0070	< 0.005	0.0054	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	MW01_1.5	1029918	0.01	0.027	0.028	0.35	0.02	0.91	< 0.005	0.0058	0.011	0.076	0.0060	0.022	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	FD06	1029918	0.01	0.03	0.034	0.43	0.03	1.1	< 0.005	0.0060	0.012	0.098	0.0085	0.031	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	FS06	EM2317440	-	0.0295	0.0321	0.307	0.0220	0.821	< 0.0002	0.006	0.0155	0.0927	0.0079	0.0199	0.0006	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0002
	MW02_0.1	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.19	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	MW02_3.0	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	MW03_0.5	1029918	< 0.005	< 0.005	< 0.005	0.014	< 0.005	0.068	< 0.005	< 0.005	< 0.005	0.0070	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	MW03_3.5	1029918	< 0.005	< 0.005	< 0.005	0.012	< 0.005	0.0082	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	SS01	1029918	0.0053	0.017	0.0056	0.034	< 0.005	0.12	< 0.005	0.012	< 0.005	0.011	< 0.005	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	SS02	1029918	0.0071	0.02	< 0.005	0.0083	< 0.005	0.048	< 0.005	0.0078	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	SS03	1029918	< 0.005	0.0058	< 0.005	0.016	< 0.005	0.11	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	SS04	1029918	0.046	0.044	0.019	0.23	0.033	5.6	0.071	0.053	0.032	0.04	0.0086	0.055	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.01
	SS05	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.044	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	SS06	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.022	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	FD05	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.042	0.011	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	FS05	EM2317440	-	0.0005	< 0.0002	0.0016	< 0.0002	0.0381	0.0098	< 0.001	0.0008	0.0008	< 0.0002	0.0006	0.0004	0.0005	0.0007	0.0002	< 0.0002	< 0.0005	< 0.0002
	SS07	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.054	0.0055	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	SS08	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.12	0.017	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.029	< 0.005	0.0082	< 0.005	< 0.005
	SS09	1029918	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Comments
#1 If the concentration of PFHxS > PFOS this guideline value needs to be adjusted accordingly. Please refer to Section 8.5.2.1 of the PFAS NEMP 2.0 guideline for further information

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)
28/06/2023, SA MFS Site Specific Criteria - Regional (Retained)

			PFAS - Perfluoroalkyl Sulfonamide						PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums					PFAS
			N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of USEPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS+ PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluorononane sulfonate (PFNS)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.0005	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.005	0.0002	0.005	0.0002	0.005
PFAS NEMP 2.0 2020 Ecological direct exposure																		
PFAS NEMP 2.0 2020 Ecological indirect exposure																		
PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)													20					
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL E													2[#1]					
SA MFS Site Specific Criteria - Metropolitan (Staffed)													14					
Date	**Field ID**	**Lab Report Number**																
20 Sep 2023	BH01_0.1	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	0.022	0.025	< 0.005	0.644	0.6067	0.7248	0.6507	0.7036	< 0.005
	BH01_1.5	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.0204	0.0094	< 0.05	0.0204	0.0204	< 0.005
	BH02_0.1	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	1.1064	1.1	1.1358	1.1064	1.1138	0.0090
	BH02_2.0	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.43	0.203	0.5372	0.443	0.495	< 0.005
	BH03_0.5	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.22	0.1296	0.3742	0.2296	0.3186	< 0.005
	BH03_1.5	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.22	0.1181	0.37	0.2281	0.3215	< 0.005
	BH04_0.5	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.059	0.059	0.059	0.059	0.059	< 0.005
	BH04_2.0	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.0401	0.032	0.0501	0.0401	0.0501	< 0.005
	BH05_0.1	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.28	0.28	0.3005	0.28	0.28	0.014
	BH05_1.0	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	1.93	1.429	2.553	1.959	2.333	< 0.005
	FD02	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	1.18	0.936	1.811	1.196	1.632	< 0.005
	FS02	EM2317440	< 0.0005	< 0.0005	< 0.0002	< 0.0005	< 0.0005	< 0.0002	< 0.0005	0.0031	< 0.0005	< 0.0005	2.00	-	2.65	-	2.47	-
21 Sep 2023	MW01_0.5	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.133	0.1054	0.1454	0.1384	0.1454	< 0.005
	MW01_1.5	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	1.26	0.932	1.4658	1.282	1.4078	< 0.005
	FD06	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	1.53	1.131	1.7895	1.561	1.7155	< 0.005
	FS06	EM2317440	< 0.0005	< 0.0005	< 0.0002	< 0.0005	< 0.0005	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	1.13	-	1.35	-	1.30	-
	MW02_0.1	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.19	0.19	0.19	0.19	0.19	< 0.005
	MW02_3.0	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.05	< 0.005	< 0.01	< 0.005
	MW03_0.5	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.082	0.068	0.089	0.082	0.089	< 0.005
	MW03_3.5	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.0202	0.0082	< 0.05	0.0202	0.0202	< 0.005
	SS01	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.154	0.12	0.2149	0.154	0.194	< 0.005
	SS02	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.0563	0.048	0.0912	0.0563	0.0841	< 0.005
	SS03	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.126	0.11	0.1318	0.126	0.1318	< 0.005
	SS04	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	5.83	5.655	6.3416	5.885	6.0626	0.1
	SS05	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.044	0.044	< 0.05	0.044	0.044	< 0.005
	SS06	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.022	0.022	< 0.05	0.022	0.022	< 0.005
	FD05	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.042	0.042	0.06	0.042	0.042	0.0070
	FS05	EM2317440	< 0.0005	< 0.0005	< 0.0002	< 0.0005	< 0.0005	< 0.0002	< 0.0005	< 0.0005	0.0006	< 0.0005	0.0397	-	0.0546	-	0.0430	-
	SS07	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.054	0.054	0.0595	0.054	0.054	< 0.005
	SS08	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	0.12	0.12	0.1837	0.12	0.12	0.0095
	SS09	1029918	< 0.005	< 0.005	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.05	< 0.005	< 0.01	< 0.005

Comments
#1 If the concentration of PFHxS > PFOS this guideline value needs to b

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Residential w/ min opportunities
28/06/2023, SA MFS Site Specific Criteria - Regional (Retained)

			PFAS - Perfluoroalkyl Sulfonic Acids							PFAS - Perfluoroalkyl Carboxylic Acids												
			Perfluoropropanesulfonic acid (PFPrS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems								0.13						220							
PFAS NEMP 2.0 2020 Freshwater - 99% - high conservation value systems								0.00023						19							
PFAS NEMP 2.0 2020 Health Drinking Water						0.07		0.07						0.56							
PFAS NEMP 2.0 2020 Recreational Water						0.7		0.7						5.6							
Date	**Field ID**	**Lab Report Number**																			
28 Sep 2023	FD01	1031201	0.82	2.0	1.6	13	0.62	12	< 0.01	0.27	0.59	2.9	0.29	0.58	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
	FS01	39939	-	3.4	4.2	28	2.1	24	< 0.02	0.61	1.1	5.5	0.62	1.5	0.21	< 0.02	< 0.02	< 0.05	< 0.1	< 0.5	< 0.1
	MW01	1031201	8.1	21	16	160	9.4	240	< 1	3.4	6.5	33	3.2	7.2	1.4	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
	MW02	1031201	0.92	2.5	2.0	17	0.88	17	< 0.01	0.32	0.70	3.5	0.35	0.74	< 0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
	MW03	1031201	2.9	7.0	5.6	37	1.8	30	< 0.01	1.0	1.8	8.0	0.79	1.7	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems
HEPA, January 2020, PFAS NEMP 2.0 2020 Freshwater - 99% - high conservation value systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

			PFAS - Perfluoroalkyl Sulfonamide						PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums					PFAS
			N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of USEPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS+ PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluorononane sulfonate (PFNS)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.05	0.05	0.02	0.05	0.05	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed s																		
PFAS NEMP 2.0 2020 Freshwater - 99% - high conservation value systems																		
PFAS NEMP 2.0 2020 Health Drinking Water													0.07					
PFAS NEMP 2.0 2020 Recreational Water													0.7					
Date	**Field ID**	**Lab Report Number**																
28 Sep 2023	FD01	1031201	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.05	< 0.01	< 0.01	25	12.58	34.78	25.58	31.63	< 0.1
	FS01	39939	< 0.05	< 0.1	< 0.02	< 0.05	< 0.5	< 0.02	< 0.01	0.03	< 0.02	< 0.02	52	25	71	-	-	-
	MW01	1031201	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 1	< 1	< 0.01	400	247.2	509.2	407.2	474.3	< 1
	MW02	1031201	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.05	< 0.01	< 0.01	34	17.74	45.91	34.74	42.11	< 0.1
	MW03	1031201	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	0.28	< 0.01	< 0.01	67	31.7	98.03	68.7	87.57	< 0.1

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to mo
HEPA, January 2020, PFAS NEMP 2.0 2020 Freshwater - 99% - high con
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

Location Code			BH05			BH05			MW01			MW01			SS	
Date			20 Sep 2023			20 Sep 2023	20 Sep 2023		21 Sep 2023			21 Sep 2023	21 Sep 2023		21 Sep	
Field ID			BH05_1.0	FD02		BH05_1.0	FS02		MW01_1.5	FD06		MW01_1.5	FS06		SS06	
Matrix Type			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	
Sample Type			Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	
Lab Report Number			1029918	1029918	RPD	1029918	EM2317440	RPD	1029918	1029918	RPD	1029918	EM2317440	RPD	1029918	
	Unit	EQL														
Misc.																
% Moisture_	%	1	23	24	4	23	-	-	15	16	6	15	-	-	13	
Inorganics																
Moisture (%)	%	0.1	-	-	-	-	23.6	-	-	-	-	-	15.1	-	-	
PFAS - Perfluoroalkyl Sulfonic Acids																
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005	0.034	0.043	23	0.034	-	-	0.01	0.01	0	0.01	-	-	< 0.005	
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	0.1	0.13	26	0.1	0.110	10	0.027	0.03	11	0.027	0.0295	9	< 0.005	
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	0.095	0.086	10	0.095	0.0914	4	0.028	0.034	19	0.028	0.0321	14	< 0.005	
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	0.53	0.26	**68**	0.53	0.384	**32**	0.35	0.43	21	0.35	0.307	13	< 0.005	
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	0.024	0.013	**59**	0.024	0.0298	22	0.02	0.03	**40**	0.02	0.0220	10	< 0.005	
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	1.4	0.92	**41**	1.4	1.62	15	0.91	1.1	19	0.91	0.821	10	0.022	
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002	< 0.005	< 0.005	0	< 0.005	< 0.0004	0	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	0.01	
PFAS - Perfluoroalkyl Carboxylic Acids																
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	0.02	0.025	22	0.02	0.024	18	0.0058	0.0060	3	0.0058	0.006	3	< 0.005	
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	0.036	0.048	29	0.036	0.0524	**37**	0.011	0.012	9	0.011	0.0155	**34**	< 0.005	
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	0.2	0.22	10	0.2	0.237	17	0.076	0.098	25	0.076	0.0927	20	< 0.005	
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	0.018	0.013	**32**	0.018	0.0178	1	0.0060	0.0085	**34**	0.0060	0.0079	27	< 0.005	
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	0.029	0.016	**58**	0.029	0.0258	12	0.022	0.031	**34**	0.022	0.0199	10	< 0.005	
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	0.067	0.037	**58**	0.067	0.0506	28	< 0.005	< 0.005	0	< 0.005	0.0006	0	< 0.005	
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	< 0.005	
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	< 0.005	< 0.005	0	< 0.005	0.0013	0	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	< 0.005	
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	< 0.005	
Perfluorotridecanoic acid	mg/kg	0.0002	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	< 0.005	
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	
PFAS - Perfluoroalkyl Sulfonamide																
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	< 0.005	< 0.005	0	< 0.005	0.0003	0	< 0.005	< 0.005	0	< 0.005	< 0.0002	0	< 0.005	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	
N-Methyl perfluorooctane sulfonamidoacetic acid	mg/kg	0.0002	< 0.01	< 0.01	0	< 0.01	< 0.0002	0	< 0.01	< 0.01	0	< 0.01	< 0.0002	0	< 0.01	
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	mg/kg	0.0005	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	
N-Ethyl perfluorooctane sulfonamidoacetic acid	mg/kg	0.0002	< 0.01	< 0.01	0	< 0.01	< 0.0002	0	< 0.01	< 0.01	0	< 0.01	< 0.0002	0	< 0.01	
PFAS - Fluorotelomer Sulfonic Acids																
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0005	< 0.01	< 0.01	0	< 0.01	0.0031	0	< 0.01	< 0.01	0	< 0.01	< 0.0005	0	< 0.01	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	< 0.005	0	< 0.005	< 0.0005	0	< 0.005	
PFAS - Sums																
Sum of PFHxS and PFOS	mg/kg	0.0002	1.93	1.18	**48**	1.93	2.00	4	1.26	1.53	19	1.26	1.13	11	0.022	
Sum of USEPA PFAS (PFOS + PFOA)*	mg/kg	0.005	1.429	0.936	**42**	1.429	-	-	0.932	1.131	19	0.932	-	-	0.022	

		Location Code	BH05			BH05			MW01			MW01			SS	
		Date	20 Sep 2023			20 Sep 2023	20 Sep 2023		21 Sep 2023			21 Sep 2023	21 Sep 2023		21 Sep	
		Field ID	BH05_1.0	FD02		BH05_1.0	FS02		MW01_1.5	FD06		MW01_1.5	FS06		SS06	
		Matrix Type	Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	
		Sample Type	Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	
		Lab Report Number	1029918	1029918	RPD	1029918	EM2317440	RPD	1029918	1029918	RPD	1029918	EM2317440	RPD	1029918	
	Unit	EQL														
PFAS (Sum of Total)	mg/kg	0.0002	2.553	1.811	**34**	2.553	2.65	4	1.4658	1.7895	20	1.4658	1.35	8	< 0.05	
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005	1.959	1.196	**48**	1.959	-	-	1.282	1.561	20	1.282	-	-	0.022	
PFAS (Sum of Total)(WA DER List)	mg/kg	0.0002	2.333	1.632	**35**	2.333	2.47	6	1.4078	1.7155	20	1.4078	1.30	8	0.022	
PFAS																
Perfluorononane sulfonate	mg/kg	0.005	< 0.005	< 0.005	0	< 0.005	-	-	< 0.005	< 0.005	0	< 0.005	-	-	< 0.005	

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 30 (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

		06		SS06		
		2023		21 Sep 2023	21 Sep 2023	
		FD05		SS06	FS05	
		Soil		Soil	Soil	
		Field_D		Normal	Interlab_D	
		1029918	RPD	1029918	EM2317440	RPD
	Unit					
Misc.						
% Moisture_	%	13	0	13	-	-
Inorganics						
Moisture (%)	%	-	-	-	2.4	-
PFAS - Perfluoroalkyl Sulfonic Acids						
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	< 0.005	0	< 0.005	-	-
Perfluorobutane sulfonic acid (PFBS)	mg/kg	< 0.005	0	< 0.005	0.0005	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	< 0.005	0	< 0.005	< 0.0002	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	< 0.005	0	< 0.005	0.0016	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	< 0.005	0	< 0.005	< 0.0002	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.042	**63**	0.022	0.0381	**54**
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.011	10	0.01	0.0098	2
PFAS - Perfluoroalkyl Carboxylic Acids						
Perfluorobutanoic acid (PFBA)	mg/kg	< 0.005	0	< 0.005	< 0.001	0
Perfluoropentanoic acid (PFPeA)	mg/kg	< 0.005	0	< 0.005	0.0008	0
Perfluorohexanoic acid (PFHxA)	mg/kg	< 0.005	0	< 0.005	0.0008	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	< 0.005	0	< 0.005	< 0.0002	0
Perfluorooctanoic acid (PFOA)	mg/kg	< 0.005	0	< 0.005	0.0006	0
Perfluorononanoic acid (PFNA)	mg/kg	< 0.005	0	< 0.005	0.0004	0
Perfluorodecanoic acid (PFDA)	mg/kg	< 0.005	0	< 0.005	0.0005	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	< 0.005	0	< 0.005	0.0007	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	< 0.005	0	< 0.005	0.0002	0
Perfluorotridecanoic acid	mg/kg	< 0.005	0	< 0.005	< 0.0002	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	< 0.005	0	< 0.005	< 0.0005	0
PFAS - Perfluoroalkyl Sulfonamide						
Perfluorooctane sulfonamide (FOSA)	mg/kg	< 0.005	0	< 0.005	< 0.0002	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	< 0.005	0	< 0.005	< 0.0005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	< 0.005	0	< 0.005	< 0.0005	0
N-Methyl perfluorooctane sulfonamidoacetic acid	mg/kg	< 0.01	0	< 0.01	< 0.0002	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	mg/kg	< 0.005	0	< 0.005	< 0.0005	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	< 0.005	0	< 0.005	< 0.0005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid	mg/kg	< 0.01	0	< 0.01	< 0.0002	0
PFAS - Fluorotelomer Sulfonic Acids						
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	< 0.005	0	< 0.005	< 0.0005	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	< 0.01	0	< 0.01	< 0.0005	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	< 0.005	0	< 0.005	0.0006	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	< 0.005	0	< 0.005	< 0.0005	0
PFAS - Sums						
Sum of PFHxS and PFOS	mg/kg	0.042	**63**	0.022	0.0397	**57**
Sum of USEPA PFAS (PFOS + PFOA)*	mg/kg	0.042	**63**	0.022	-	-

		06		SS06		
		2023		21 Sep 2023	21 Sep 2023	
		FD05		SS06	FS05	
		Soil		Soil	Soil	
		Field_D		Normal	Interlab_D	
		1029918	RPD	1029918	EM2317440	RPD
	Unit					
PFAS (Sum of Total)	mg/kg	0.06	18	< 0.05	0.0546	9
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.042	**63**	0.022	-	-
PFAS (Sum of Total)(WA DER List)	mg/kg	0.042	**63**	0.022	0.0430	**65**
PFAS						
Perfluorononane sulfonate	mg/kg	0.0070	**33**	< 0.005	-	-

***RPDs have only been considered where a concer**
****Elevated RPDs are highlighted as per QAQC Pro**
*****Interlab Duplicates are matched on a per compo**

Date			20 Sep 2023		21 Sep 2023	28 Sep 2023
Matrix Type			Water		Water	Water
Lab Report Number			1029918		1029918	1031201
	Unit	EQL				
PFAS - Perfluoroalkyl Sulfonic Acids						
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
PFAS - Perfluoroalkyl Carboxylic Acids						
Perfluorobutanoic acid (PFBA)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorononanoic acid (PFNA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
PFAS - Perfluoroalkyl Sulfonamide						
Perfluorooctane sulfonamide (FOSA)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
N-Methyl perfluorooctane sulfonamidoacetic acid	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05

		Date	20 Sep 2023		21 Sep 2023	28 Sep 2023
		Matrix Type	Water		Water	Water
		Lab Report Number	1029918		1029918	1031201
	Unit	EQL				
N-Ethyl perfluorooctane sulfonamidoacetic acid	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
PFAS - Fluorotelomer Sulfonic Acids						
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
PFAS - Sums						
Sum of PFHxS and PFOS	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
PFAS (Sum of Total)	µg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
PFAS (Sum of Total)(WA DER List)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
PFAS						
Perfluorononane sulfonate	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01

Appendix H

Well Permits

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	448399
Expiry Date:	04/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 5800/269
   Section 57
   Hundred of Pirie

2. The authorised activity must be undertaken by a licensed driller.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
4. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
5. Water samples are required from all wells drilled in respect of this permit.
6. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
7. Strata samples are not required.
8. This work may be subject to inspection by the Department's Drilling Inspectors.
9. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

10. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
11. All wells must be drilled vertical unless written permission is obtained from the Minister.
12. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
13. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
14. The activity must not adversely affect water-dependent ecosystems nearby.
15. The activity shall not significantly increase local drawdown.
16. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.
17. The activity shall not adversely affect the quality, quantity and accessibility of water for supply from existing wells operated by other landholders.
18. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
19. The well subject to this permit must not be completed as an industrial water supply well unless prior approval has been obtained from the department.
20. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
21. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
22. The well is not to penetrate beyond a depth of 40 metres unless approved by the Regional Hydrogeologist.
23. Due to known soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well.

NOTES:

1. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
2. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
3. This permit is not transferable.

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

4. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
5. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
6. This permit is not an approval to clear native vegetation.
7. This permit does not authorise the taking of water from the well for any purpose other than testing.
8. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 04/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

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PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	448400
Expiry Date:	04/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 5800/269
   Section 57
   Hundred of Pirie

2. The authorised activity must be undertaken by a licensed driller.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
4. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
5. Water samples are required from all wells drilled in respect of this permit.
6. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
7. Strata samples are not required.
8. This work may be subject to inspection by the Department's Drilling Inspectors.
9. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

10. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
11. All wells must be drilled vertical unless written permission is obtained from the Minister.
12. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
13. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
14. The activity must not adversely affect water-dependent ecosystems nearby.
15. The activity shall not significantly increase local drawdown.
16. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.
17. The activity shall not adversely affect the quality, quantity and accessibility of water for supply from existing wells operated by other landholders.
18. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
19. The well subject to this permit must not be completed as an industrial water supply well unless prior approval has been obtained from the department.
20. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
21. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
22. The well is not to penetrate beyond a depth of 40 metres unless approved by the Regional Hydrogeologist.
23. Due to known soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well.

NOTES:

1. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
2. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
3. This permit is not transferable.

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

4. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
5. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
6. This permit is not an approval to clear native vegetation.
7. This permit does not authorise the taking of water from the well for any purpose other than testing.
8. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 04/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	448401
Expiry Date:	04/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 5800/269
   Section 57
   Hundred of Pirie

2. The authorised activity must be undertaken by a licensed driller.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
4. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
5. Water samples are required from all wells drilled in respect of this permit.
6. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
7. Strata samples are not required.
8. This work may be subject to inspection by the Department's Drilling Inspectors.
9. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.

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11. All wells must be drilled vertical unless written permission is obtained from the Minister.
12. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
13. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
14. The activity must not adversely affect water-dependent ecosystems nearby.
15. The activity shall not significantly increase local drawdown.
16. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.
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NOTES:

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2. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
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7. This permit does not authorise the taking of water from the well for any purpose other than testing.
8. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

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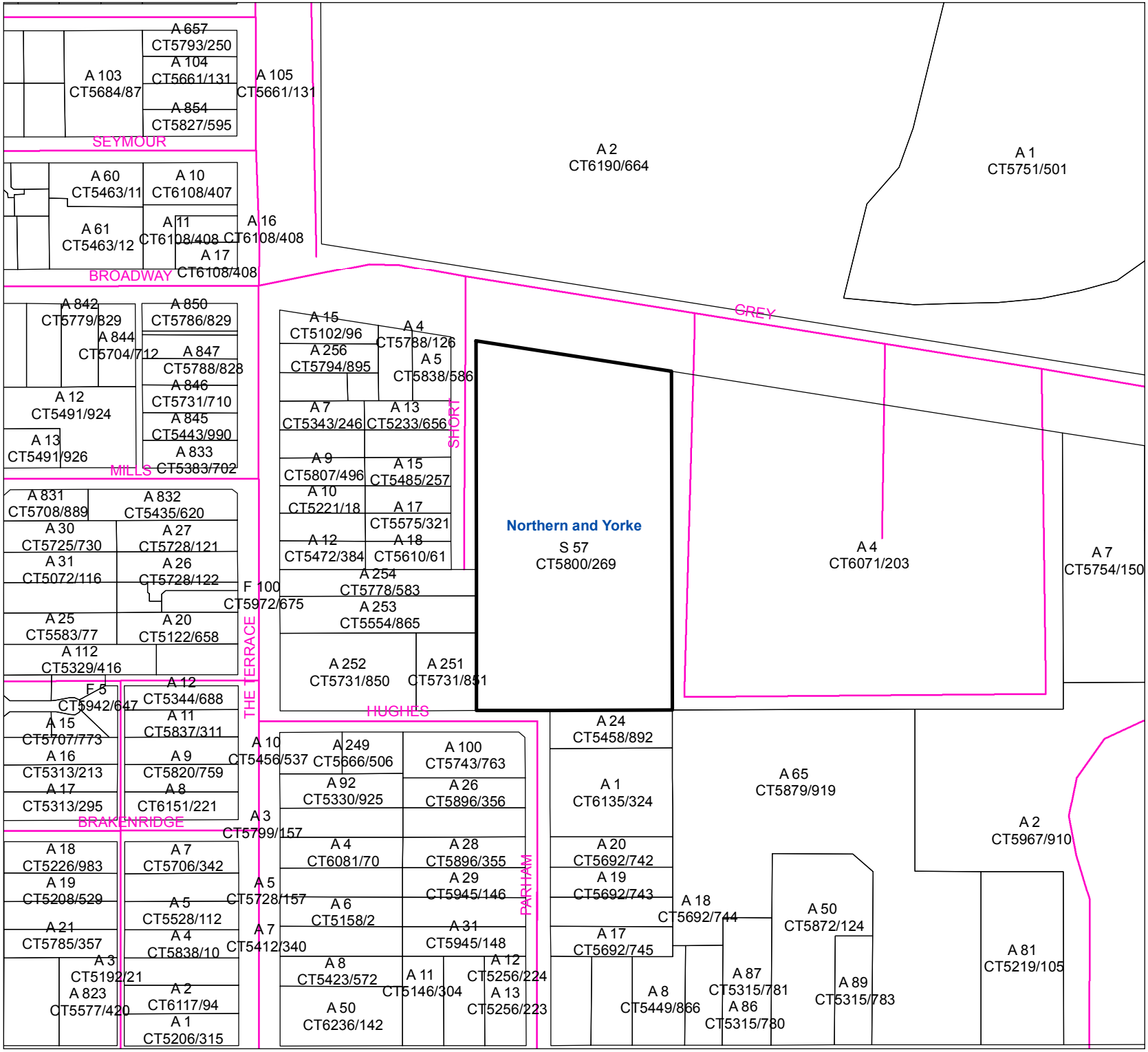
Date: 04/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water



PLEASE ATTACH WELL LOCATION MAP TO THE DRILLERS REPORT

CLIENT: GHD P/L
Permit No: 448399 TO 448401 (3)
Prescribed Area: NTH
Hundred: PIRIE
Suburb: PORT PIRIE SOUTH
NRM Region/Plan: N & Y
CT 5800/269, H241000, S57 X3

Legend

- DCDB.ParcelCadastreFull
- Topo.Roads
- LANDSCAPE REGIONS
- Prescribed Wells Area
- Prescribed Watercourse

0 87.5 175
Meters

Government of South Australia
Department for Environment and Water

Appendix I

Survey

LINKUP CONSTRUCTION SURVEYS PTY LTD

`

To: Tom Duncan
Company: GHD
Phone: 0413 476 581

From: Lincoln Jeffery
Phone: 0414 840 569
Email: Lincoln@linkupconstructionsurveys.com.au

Date: 18/10/2023

Monitoring well coordinates –
Port Pirie MFS

Well or Bore No.	Easting GDA20	Northing GDA20	R.L. Top of Casing A.H.D.	Natural Surface A.H.D.
MW01	220809.062	6323616.997	2.975	3.079
MW02	220789.928	6323642.176	2.962	3.061
MW03	220808.454	6323651.391	2.995	3.075

All Survey information was based from the GDA20 Z54 grid system and Australian Height Datum (AHD), Triangulated from Network Survey Marks.

Appendix J

Groundwater Purge Records

Purging and Sampling Record

Bore ID: ……MW01…….

Job Information	*Sampling Information*	*Bore Information*
Client: …SA MFS……..……	**Purge Method:……..……**	**SWL(mbTOC): ……2.014…… m Logic Check: ……..**
Project: ...Port Pirie DSI.....……	**Sample Method:……..……**	**Screen: From:…4.466…to…1.466.. m Stick Up: …….. m**
Proj. No.: …12616807...……..……	**WQ Meter Type:…YSI……..……**	**NAPL Check:…..……..…….. Bore Diam.: ……50.... mm**
Sampler: …AK……..……	**Flow Cell: Y / N Pump Depth:…4….m**	**Ref.datum: …… Well Cap Secure?……**
Date: …21/9/23..……..……	**WLevel Meter Type: Dip**	**Bore Depth: ……4.466……. m**
Round ……..……	**Field Filtered? Y / N** (filter vessel, disposable filter/syringe)	

Time (……)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (……)	Dis.Oxygen (……)	Ox-Red Pt. (± mV)	SWL (m TOC)	(……)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
		21.1	7.18	67240	21.8	56.6	2.107		Brown, high turbidity/sediment load, no odour, no sheen.
									~45 L purged

Comment: **Duplicate samples collected, bottles used, access, condition of headworks etc**

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

***Double for gravel pack**

Purging and Sampling Record

Bore ID: .....MW02.....

Job Information	*Sampling Information*	*Bore Information*
Client: …SA MFS……	**Purge Method:……**	**SWL(mbTOC): ……2.430……. m Logic Check: ……..**
Project: ...Port Pirie DSI.....	**Sample Method:……**	**Screen: From:…4.50…to…1.50.. m Stick Up: …….. m**
Proj. No.: …12616807.....	**WQ Meter Type:…YSI……**	**NAPL Check:…..…….. Bore Diam.: …50..... mm**
Sampler: …AK……..	**Flow Cell: Y / N Pump Depth:…….m**	**Ref.datum: ……. Well Cap Secure?……**
Date: …21/9/23..	**WLevel Meter Type: Dip**	**Bore Depth: ……4.104……. m**
Round ……..	**Field Filtered? Y / N** (filter vessel, disposable filter/syringe)	

Time (……)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
		22.6	7.54	41577	0.13	27.7	2.524		Brown, high turbidity/sediment load, no odour, no sheen.
									~48 L purged, moderate recharge rate.
									4.439 well depth post-development.

Comment: **Duplicate samples collected, bottles used, access, condition of headworks etc**

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

***Double for gravel pack**

Purging and Sampling Record

Bore ID: ……MW03……

Job Information	*Sampling Information*	*Bore Information*
Client: …SA MFS……	**Purge Method:……**	**SWL(mbTOC): ……1.901…… m** **Logic Check: ……..**
Project: ...Port Pirie DSI.....	**Sample Method:……**	**Screen: From:…4.50…to…1.50.. m** **Stick Up: …….. m**
Proj. No.: …12616807.....	**WQ Meter Type:…YSI……**	**NAPL Check:…..** **Bore Diam.: …50….. mm**
Sampler: …AK……	**Flow Cell: Y / N** **Pump Depth:…….m**	**Ref.datum: ……** **Well Cap Secure?……**
Date: …21/9/23……	**WLevel Meter Type:** **Dip**	**Bore Depth: …4.448…… m**
Round ……	**Field Filtered? Y / N** (filter vessel, disposable filter/syringe)	

Time (……)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
		21.3	7.18	51929	4.90	21.1	1.95		Brown, high turbidity/sediment load, no odour, no sheen.
									~52 L purged

Comment: **Duplicate samples collected, bottles used, access, condition of headworks etc**

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

***Double for gravel pack**

Purging and Sampling Record

Bore ID: MW01

Job Information

Client: MES
Project: Port Rinia GME
Proj. No.: 12616807
Sampler: RT / JA
Date: 28/9/23
Round

Sampling Information

Purge Method: Low flow Bladder Pump
Sample Method:
WQ Meter Type: YSI
Flow Cell: (Y) / N Pump Depth: 3.40 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
Field Filtered? Y / N (filter vessel, disposable filter/syringe)

Bore Information

SWL(mbTOC): 2.53 m Logic Check:
Screen: From: to: m Stick Up: m
NAPL Check: Bore Diam.: mm
Ref.datum: Well Cap Secure? Y
Bore Depth: 4.45 m

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
12:15	2.0	21.4	7.02	63856	0.03	-42.3	2.57	CPM4	
12:18	3.2	21.4	7.02	64834	0.01	-53.7	2.59		
12:21	4.4	21.8	7.01	65029	0.01	-62.1	2.57		
12:24	5.6	22.2	7.01	65106	0.01	-63.4	2.57		
									Greyish Brown, low turbidity, moderate sediment load, no sheen, no odour, m-h flow rate.
									V= 5.6L purged

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW32

Job Information

Client: MFS
Project: 12616807
Proj. No.: Port Pirie GME
Sampler: JA/RT
Date: 28/9/23
Round

Sampling Information

Purge Method: low flow bladder pump
Sample Method:
WQ Meter Type: YSI
Flow Cell: (Y) / N Pump Depth: 3.40 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
Field Filtered? Y / N (filter vessel, disposable filter/syringe)

Bore Information

SWL(mbTOC): 2.45 m Logic Check:
Screen: From: to: m Stick Up: m
NAPL Check: Bore Diam.: mm
Ref.datum: Well Cap Secure? Y
Bore Depth: 4.45 m

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
10:00	2.6	22.7	7.87	10798	0.23	187.0	2.54	CPMH	
10:05	4.0	22.6	7.72	10500	11.42	116.8	2.54		
11:18	5.2	22.4	7.61	25762	2.19	11.3	2.54		Trouble with pump - air-flow fixed
11:21	6.4	22.5	7.59	28369	1.05	-59.0	2.54		
11:24	7.6	22.5	7.57	30411	7.24	-71.2	2.54		
11:27	8.8	22.4	7.57	31169	7.24	-80.4	2.54		
11:30	10.0	22.4	7.57	31484	6.89	-83.4	2.54		Pale brown low turbidity low load. V=10.0L purged

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW03

Job Information
- Client: MFS
- Project: Port Pirie GME
- Proj. No.: 12616807
- Sampler: JA/RT
- Date: 28/9/23
- Round:

Sampling Information
- Purge Method: low flow bladder pump
- Sample Method:
- WQ Meter Type: YSI
- Flow Cell: (Y) / N
- Pump Depth: 3.20 m
- WLevel Meter Type: Dip / Fox / Int.Fce / Gge
- Field Filtered? Y / N (filter vessel, disposable filter/syringe)

Bore Information
- SWL(mbTOC): 2.55 m
- Screen: From: ..... to ..... m
- NAPL Check:
- Ref.datum:
- Bore Depth: 4.44 m
- Logic Check:
- Stick Up: ..... m
- Bore Diam.: ..... mm
- Well Cap Secure? Y

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*			
10:00	2.0	20.1	6.99	48389	0.14	-22.3	2.60	CPM4	
10:05	4.0	20.0	7.01	49053	0.02	-43.7	2.63		
10:10	6.0	20.0	7.02	49273	0.01	-55.2	2.63		
10:15	8.0	20.3	7.02	50206	—	-63.5	2.63		
10:20	10.0	20.3	7.04	50888	—	-68.9	2.63		
10:25	12.0	20.3	7.04	51070	—	-68.7	2.63		
									Grey/tan Brown, low turbidity, moderate sediment load, no sheen, no odour, m-h flow rate
									V = 12.0L purged

Field QA Checks:
- Air bubbles in vials? Y / N Any violent reactions? Y / N
- Decontamination as per GHD procedure? Y / N
- Was sampling equipment pre-cleaned? Y / N
- COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Appendix K

QAQC Report

Appendix I - Quality Assurance and Quality Control Report

1. GHD QA/QC Assessment

1.1 Laboratories and data set

All samples recovered during the detailed site investigation (DSI) were submitted to Eurofins, ALS and Envirolab, which are National Association of Testing Authorities (NATA) accredited laboratories, accredited to perform the required analysis.

The selected laboratories conducted all the requested analyses in accordance with the guidelines outlined in NEPM 1999 (as amended 2013).

The laboratories used for sample analysis are set out in Table 1.1.

Table 1.1 Analytical laboratories and reports

Laboratory	Primary or Secondary	NATA Certified for Analysis Requested	Report No
Eurofins	Primary	Yes	1031201 1029918
ALS	Secondary	Yes	EM2317440
Envirolab	Secondary	Yes	33939

The primary results for the DSI are outlined in the Tabulated Analytical Results section of the DSI report. The laboratory certificates of analysis are located in the Laboratory Reports section of the DSI report. The QAQC results for the DSI are outlined in the tables at the end of this QAQC report.

The data quality assessment detailed in the following pages refers to the data provided in these laboratory reports and the results of the QAQC analysis. Please note this QAQC report excludes results and laboratory reports from historical sampling events.

1.2 Data quality indicators

Table 1.2 sets out the QA/QC Data Quality Indicators (DQIs) used in the sampling investigation and outcomes for each of these for each DQI.

Table 1.2 Summary of QA/QC compliance for sampling

Item	Objective	Outcome	References
GHD Internal Procedures			
Comparison of field and analytical data	Agreement between visual and olfactory evidence with laboratory results	Achieved	Tabulated Analytical Results Certificates of Analysis Borelogs / Field Records
Calibration of field instruments	Meet calibration specifications	Achieved	Copies of calibration certificates.
Chain of Custody documentation	Supply Chain of Custody Documentation with all samples	Achieved	Copies of Chain of Custody Documentation.
Sample analysis and extraction holding times	Comply with holding times	Achieved	Eurofins/ALS/Envirolab Laboratory Quality Control Reports.

Item	Objective	Outcome	References
GHD Internal Procedures			
Analysis of inter- and intra-laboratory duplicate samples	Analysis of duplicate samples in 10% of primary samples	Achieved	AS4482.1-2005 and US EPA NEPM 1999 (as amended 2013) and Eurofins/ALS certificates of analysis. PFAS NEMP 2.0
Analysis of duplicate and split samples	Frequencies and RPDs within guideline and internal laboratory limits (RPD of 0-30%)	Minor non-conformances as stated in Table 2.1	AS4482.1-2005 and US EPA NEPM 1999 (as amended 2013) and Eurofins/ALS certificates of analysis. PFAS NEMP 2.0
External Laboratory Procedures			
Analysis of laboratory method blanks	No contamination of blanks	Achieved	Eurofins/ALS Laboratory Quality Control Reports.
Analysis of laboratory spike recoveries	Recoveries within the laboratory specified recovery limits	Achieved, with some minor non-conformances – see Table 3.2	Eurofins/ALS Laboratory Quality Control Reports
Analysis of laboratory internal duplicates	Frequencies and RPDs within guideline and internal laboratory limits (RPD of 0-30%)	Achieved	NEPM 1999 (as amended 2013). Eurofins/ALS Laboratory Quality Control Reports

QA/QC assessment method

Established QA/QC procedures to assess data quality were maintained throughout the project. The QA/QC program undertaken as part of the assessment by GHD included the following:

- Use of appropriately qualified and trained staff,
- Preservation of samples with ice during transport from the field to the laboratory,
- Transportation of samples with accompanying chain-of-custody documentation,
- Compliance with sample holding times,
- Review of results of blind duplicate samples,
- Review of results of split duplicate samples,
- Review of results of field blank samples,
- Review of internal analysis of laboratory duplicates, spikes and blanks.

The QC program employed during this investigation was in accordance with the general requirements set out in the Australian Standard AS4482.1 (2005) and the NEMP 2.0 (2020) QC samples provide information that discounts or potentially identifies errors due to possible sources of cross contamination, inconsistencies in sampling and analytical techniques used. The QC program completed included the collection and analysis of duplicate samples, rinsate samples and trip blank samples as described below:

- **Split duplicate samples**: These are duplicate samples split in the field, with one sample being sent to a secondary laboratory for analysis. The same parameters are analysed utilising similar analytical techniques.
- **Blind duplicate samples**: These are coded duplicate samples submitted to the primary laboratory for analysis as individual samples without any indication to the laboratory that they have been duplicated.
- **Rinsate samples**: A sample of deionised water collected from equipment used during sampling to indicate whether cross contamination occurred from equipment.
- **Trip Blanks**: A laboratory supplied uncontaminated (blank) deionised water sample which is placed within the ice chest with the samples. This sample is analysed at the laboratory to indicate if contamination occurred during transportation of samples.

A quantitative measure of the duplicate sample results was made using calculated relative percentage difference (RPD) values for each chemical. The RPD values were calculated using the following equation.

$$RPD(\%) = \frac{(C_o - C_s)}{\left(\frac{C_o + C_s}{2}\right)} \times 100$$

Where C_o = reported concentration of the chemical of interest from the original parent sample

Cs = reported concentration of the chemical of interest from the duplicate sample

2. GHD QA/QC

2.1 Duplicate samples

Elevated RPD values for duplicate and split samples are summarised in Table 2.1 and presented in full in at the end of this Appendix.

Table 2.1 Blind duplicate and split duplicate RPD exceedance summary - soil

Primary Sample	QC Sample (Duplicate or Split)	Analyte	Primary result (mg/kg)	Duplicate Result (mg/kg)	Split result (mg/kg)	Highest RPD (%)
Soil						
BH05_1.0	FD02 (D) FS02 (S)	PFHxS	0.53	0.26	0.384	68
		PFHpS	0.024	0.013	0.0298	59
		PFOS	1.4	0.92	1.62	41
		PFPeA	0.036	0.048	0.0524	37
		PFPpA	0.018	0.013	0.0178	32
		PFOA	0.029	0.016	0.0258	58
		PFDA	0.067	0.037	0.0506	58
		Sum of PFHxS and PFOS	1.93	1.18	2.0	48
		Sum of US EPA PFAS (PFOS + PFOA)	1.49	0.936	-	42
		PFAS (Sum of total)	2.553	1.811	2.65	34
		Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	1.959	1.196	-	48
		PFAS (Sum of Total) (WA DER List)	2.333	1.632	2.47	35
MW01_1.5	FD06 (D) FS06 (S)	PFHpS	0.02	0.03	0.022	40
		PFPeA	0.011	0.012	0.0155	34
		PFHpA	0.006	0.0085	0.0079	34
		PFOA	0.022	0.031	0.0199	34
SS06	FD05 (D) FS05 (S)	PFOS	0.022	0.042	0.0381	63
		Sum of PFHxS and PFOS	0.022	0.042	0.0397	63
		Sum of US EPA PFAS (PFOS + PFOA)	0.022	0.042	-	63
		Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	0.022	0.042	-	63

		PFAS (Sum of Total) (WA DER List)	0.022	0.042	0.043	65
		PFNS	<0.005	0.007	-	33
Groundwater						
MW02	FD01 (D) FS01 (S)	PFBS	2.5	2.0	3.4	31
		PFPeS	2.0	1.6	4.2	71
		PFHxS	17	13	28	49
		PFHpS	0.88	0.62	2.1	82
		PFOS	17	12	24	34
		PFBA	0.32	0.27	0.61	62
		PFPeA	0.7	0.59	1.1	44
		PFHxA	3.5	2.9	5.5	44
		PFHpA	0.35	0.29	0.62	56
		PFOA	0.74	0.58	1.5	68
		PFNA	<0.1	0.11	0.21	71
		Sum of PFHxS and PFOS	34	25	52	42
		Sum of US EPA PFAS (PFOS + PFOA)	17.74	12.58	25	34
		PFAS (Sum of Total)	45.91	34.78	71	43

2.1.1 Soil blind duplicate and split duplicate

The majority of RPDs were calculated within acceptable limits, with the exception of some PFAS analytes in 3 duplicate samples. The elevated RPDs can be attributed to the following:

– Low analyte concentrations close to or below the LOR.
– Heterogeneity of soils, particularly soils sampled within fill material.

Given the heterogeneity of soils, the majority of results being within the same order of magnitude, and the relatively minor concentrations reported for the majority of elevated RPDs, GHD considers the data set to be of an acceptable quality for which to base the assessment.

2.1.2 Water blind duplicate and split duplicate samples

The majority of RPDs were calculated within acceptable limits, with the exception of some PFAS analytes in 1 duplicate sample. For the blind sample, the RPDs were only slightly elevated and can be attributed to the following:

– Low analyte concentrations close to or below the LOR.

The elevated RPDs for 1 split duplicate sample indicate that a possible mistake was made during field sampling which has lead to cross contamination.

2.1.3 Blind duplicate and split duplicate sample frequency

A summary of the blind and split duplicate sample frequency is presented in Table 2.2.

Table 2.2 Blind duplicate and split duplicate frequency summary

Primary Samples Count	Blind Duplicate Samples Count	Percentage of Primary Samples	Split Samples Count	Percentage of Primary Samples
Soil (Boreholes)				
16	2	12.5%	2	12.5%

Primary Samples Count	Blind Duplicate Samples Count	Percentage of Primary Samples	Split Samples Count	Percentage of Primary Samples
Soil (Surface)				
9	1	11.1%	1	11.1%
Groundwater				
3	1	33.3%	1	33.3%

The QC rates for the samples satisfies the data quality objectives for this investigation as they are in general accordance with Australian Standard AS4482.1-2005 and the NEMP 2.0 (2020).

2.2 Rinsate blank

Three rinsate blank samples were collected during the DSI and analysed for PFAS. All concentrations of PFAS analytes were reported below the laboratory LOR for analyses carried out, meeting the Data Quality Objectives of the project. The tabulated results for rinsate samples are presented at the end of this Appendix.

3. Laboratory QA/QC

3.1 Internal duplicates

All RPDs for laboratory internal duplicates from the Eurofins, ALS and Envirolab reports were within the laboratory nominated acceptable ranges, with the exception of those presented in Table 3.1.

Table 3.1 Internal duplicate RPD outliers - soil

Analyte	Lab report	Primary Sample	RPD (%)	RPD Limit (%)	Comment
Soil					
PFOS	EM2317440	EM2317495-024	38.1	20	RPD exceeds LOR based limits
PFDA			29.1		
PFUnDA			31.9		
PFDoDA			29.0		
PFTrDA			26.1		
FOSA			38.1		
8:2 FTS			47.0		
10:2 FTS			32.2		
Sum of PFAS			38.2		
Sum of PFHxS and PFOS			37.8		
Sum of PFAS (WA DER List)			38.4		
PFBS	1029918	M23-Se0065227	41	30	Q15 - The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.
PFPrS			42		
PFNS		M23-Se0065247	41		

3.2 Matrix spikes

Matrix spikes from the laboratory reports were within the acceptable ranges, with the exception of those presented in Table 3.2.

Table 3.2 Matrix spike outliers

Lab report	Analyte	Laboratory comment
ALS		
EM2317440	PFOS	MS recovery not determined, background level greater than or equal to 4x spike level.
	PFDS	MS recovery not determined, background level greater than or equal to 4x spike level.
	10:2 FTS	Recovery less than lower data quality objective.

3.3 Laboratory control spikes

All laboratory control spikes from the laboratory reports were within the nominated acceptable ranges.

3.4 Method blanks

All reported method blank concentrations were less than their respective laboratory LOR and indicating that potential laboratory cross contamination was unlikely to have occurred.

3.5 Compliance with holding times

All analytes were extracted and analysed within both Eurofins', ALS' and Envirolabs' technical holding times.

3.6 Laboratory QA/QC summary

Given the relatively low number of laboratory QA/QC result outliers and the presence of matrix interference in the majority of matrix spike outliers, GHD considered the data to be of satisfactory precision on which to base the assessment.

3.7 Conclusion

Based on the QA/QC program undertaken during the sampling programs, the data obtained during the assessment is considered to be of an acceptable standard on which to base interpretations and draw conclusions regarding the environmental status of the Site.

Field or Interlab Duplicates

Lab Report Number				1029918	1029918		1029918	EM2317440		1029918	1029918		1029918	EM2317440		1029918	1029918		1029918	EM2317440	
Field ID				BH05_1.0	FD02		BH05_1.0	FS02		MW01_1.5	FD06		MW01_1.5	FS06		SS06	FD05		SS06	FS05	
Location Code				BH05	BH05		BH05			MW01	MW01		MW01			SS06	SS06		SS06		
Matrix Type				Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
Date				20 Sep 2023	20 Sep 2023		20 Sep 2023	20 Sep 2023		21 Sep 2023	21 Sep 2023		21 Sep 2023	21 Sep 2023		21 Sep 2023	21 Sep 2023		21 Sep 2023	21 Sep 2023	
Sample Type				Normal	Field_D	RPD	Normal	Interlab_D	RPD	Normal	Field_D	RPD	Normal	Interlab_D	RPD	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL	**RPD**																		
Misc.																					
% Moisture_	%	1		23	24	4	23	-	-	15	16	6	15	-	-	13	13	0	13	-	-
Inorganics																					
Moisture (%)	%	0.1		-	-	-	-	23.6	-	-	-	-	-	15.1	-	-	-	-	-	2.4	-
PFAS - Perfluoroalkyl Sulfonic Acids																					
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		0.1[#1]	0.13[#1]	26	0.1[#1]	0.110	10	0.027[#1]	0.03[#1]	11	0.027[#1]	0.0295	9	<0.005	<0.005	0	<0.005	0.0005	0
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		<0.005	<0.005	0	<0.005	<0.0004[#2]	0	<0.005	<0.005	0	<0.005	<0.0002	0	0.01[#1]	0.011[#1]	10	0.01[#1]	0.0098	2
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		0.024[#1]	0.013[#1]	**59**	0.024[#1]	0.0298	22	0.02[#1]	0.03[#1]	**40**	0.02[#1]	0.0220	10	<0.005	<0.005	0	<0.005	<0.0002	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002		1.4[#1]	0.92[#1]	**41**	1.4[#1]	1.62	15	0.91[#1]	1.1[#1]	19	0.91[#1]	0.821	10	0.022[#1]	0.042[#1]	**63**	0.022[#1]	0.0381	**54**
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		0.034	0.043	23	0.034	-	-	0.01	0.01	0	0.01	-	-	<0.005	<0.005	0	<0.005	-	-
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		0.095[#1]	0.086[#1]	10	0.095[#1]	0.0914	4	0.028[#1]	0.034[#1]	19	0.028[#1]	0.0321	14	<0.005	<0.005	0	<0.005	<0.0002	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		0.53[#1]	0.26[#1]	**68**	0.53[#1]	0.384	**32**	0.35[#1]	0.43[#1]	21	0.35[#1]	0.307	13	<0.005	<0.005	0	<0.005	0.0016	0
PFAS - Perfluoroalkyl Carboxylic Acids																					
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		0.02	0.025	22	0.02	0.024	18	0.0058	0.0060	3	0.0058	0.006	3	<0.005	<0.005	0	<0.005	<0.001	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		<0.005	<0.005	0	<0.005	<0.0002	0	<0.005	<0.005	0	<0.005	<0.0002	0	<0.005	<0.005	0	<0.005	0.0005	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		<0.005	<0.005	0	<0.005	<0.0002	0	<0.005	<0.005	0	<0.005	<0.0002	0	<0.005	<0.005	0	<0.005	0.0002	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		0.018[#1]	0.013[#1]	**32**	0.018[#1]	0.0178	1	0.0060[#1]	0.0085[#1]	**34**	0.0060[#1]	0.0079	27	<0.005	<0.005	0	<0.005	<0.0002	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		0.2	0.22	10	0.2	0.237	17	0.076	0.098	25	0.076	0.0927	20	<0.005	<0.005	0	<0.005	0.0008	0
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		0.067	0.037	**58**	0.067	0.0506	28	<0.005	<0.005	0	<0.005	0.0006	0	<0.005	<0.005	0	<0.005	0.0004	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002		0.029[#1]	0.016[#1]	**58**	0.029[#1]	0.0258	12	0.022[#1]	0.031[#1]	**34**	0.022[#1]	0.0199	10	<0.005	<0.005	0	<0.005	0.0006	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		0.036	0.048	29	0.036	0.0524	**37**	0.011	0.012	9	0.011	0.0155	**34**	<0.005	<0.005	0	<0.005	0.0008	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.005	<0.005	0	<0.005	<0.0002	0	<0.005	<0.005	0	<0.005	<0.0002	0	<0.005	<0.005	0	<0.005	<0.0002	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		<0.005	<0.005	0	<0.005	0.0013	0	<0.005	<0.005	0	<0.005	<0.0002	0	<0.005	<0.005	0	<0.005	0.0007	0
PFAS - Perfluoroalkyl Sulfonamide																					
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002		<0.01	<0.01	0	<0.01	<0.0002	0	<0.01	<0.01	0	<0.01	<0.0002	0	<0.01	<0.01	0	<0.01	<0.0002	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002		<0.01	<0.01	0	<0.01	<0.0002	0	<0.01	<0.01	0	<0.01	<0.0002	0	<0.01	<0.01	0	<0.01	<0.0002	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	mg/kg	0.0005		<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		<0.005	<0.005	0	<0.005	0.0003	0	<0.005	<0.005	0	<0.005	<0.0002	0	<0.005	<0.005	0	<0.005	<0.0002	0
PFAS - Fluorotelomer Sulfonic Acids																					
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0005		<0.01	<0.01	0	<0.01	0.0031	0	<0.01	<0.01	0	<0.01	<0.0005	0	<0.01	<0.01	0	<0.01	<0.0005	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	<0.0005	0	<0.005	<0.005	0	<0.005	0.0006	0
PFAS - Sums																					
PFAS (Sum of Total)	mg/kg	0.0002		2.553	1.811	**34**	2.553	2.65	4	1.4658	1.7895	20	1.4658	1.35	8	<0.05	0.06	18	<0.05	0.0546	9
PFAS (Sum of Total)(WA DER List)	mg/kg	0.0002		2.333	1.632	**35**	2.333	2.47	6	1.4078	1.7155	20	1.4078	1.30	8	0.022	0.042	**63**	0.022	0.0430	**65**
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		1.429	0.936	**42**	1.429	-	-	0.932	1.131	19	0.932	-	-	0.022	0.042	**63**	0.022	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002		1.93	1.18	**48**	1.93	2.00	4	1.26	1.53	19	1.26	1.13	11	0.022	0.042	**63**	0.022	0.0397	**57**
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		1.959	1.196	**48**	1.959	-	-	1.282	1.561	20	1.282	-	-	0.022	0.042	**63**	0.022	-	-
PFAS																					
Perfluorononane sulfonate (PFNS)	mg/kg	0.005		<0.005	<0.005	0	<0.005	-	-	<0.005	<0.005	0	<0.005	-	-	<0.005	0.0070[#1]	**33**	<0.005	-	-

Comments

#1 Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
#2 Reported Analyte LOR is higher than Requested Analyte LOR

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 30 (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

Field or Interlab Duplicates

			Lab Report Number	1031201	1031201		1031201	39939	
			Field ID	MW02	FD01		MW02	FS01	
			Location Code	MW02			MW02		
			Matrix Type	Water	Water		Water	Water	
			Date	28 Sep 2023	28 Sep 2023		28 Sep 2023	28 Sep 2023	
			Sample Type	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL	**RPD**						
PFAS - Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01		2.5[#1]	2.0[#1]	22	2.5[#1]	3.4	**31**
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.02	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01		0.88[#1]	0.62[#1]	**35**	0.88[#1]	2.1	**82**
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01		17[#1]	12[#1]	**34**	17[#1]	24	**34**
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		0.92	0.82	11	0.92	-	-
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01		2.0[#1]	1.6[#1]	22	2.0[#1]	4.2	**71**
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		17[#1]	13[#1]	27	17[#1]	28	**49**
PFAS - Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	µg/L	0.02		0.32	0.27	17	0.32	0.61	**62**
Perfluorodecanoic acid (PFDA)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.02	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.05	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01		0.35[#1]	0.29[#1]	19	0.35[#1]	0.62	**56**
Perfluorohexanoic acid (PFHxA)	µg/L	0.01		3.5	2.9	19	3.5	5.5	**44**
Perfluorononanoic acid (PFNA)	µg/L	0.01		<0.1	0.11[#1]	10	<0.1	0.21	**71**
Perfluorooctanoic acid (PFOA)	µg/L	0.01		0.74[#1]	0.58[#1]	24	0.74[#1]	1.5	**68**
Perfluoropentanoic acid (PFPeA)	µg/L	0.01		0.70	0.59	17	0.70	1.1	**44**
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.5	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.1	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.02	0
PFAS - Perfluoroalkyl Sulfonamide									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05		<0.05	<0.05	0	<0.05	<0.1	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02		<0.05	<0.05	0	<0.05	<0.02	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05		<0.05	<0.05	0	<0.05	<0.5	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05		<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02		<0.05	<0.05	0	<0.05	<0.02	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05		<0.05	<0.05	0	<0.05	<0.05	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.05		<0.05	<0.05	0	<0.05	<0.1	0
PFAS - Fluorotelomer Sulfonic Acids									
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.02	0
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.01	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.01		<0.05	<0.05	0	<0.05	0.03	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.02	0
PFAS - Sums									
PFAS (Sum of Total)	µg/L	0.01		45.91	34.78	28	45.91	71	**43**
PFAS (Sum of Total)(WA DER List)	µg/L	0.05		42.11	31.63	28	42.11	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01		17.74	12.58	**34**	17.74	25	**34**
Sum of PFHxS and PFOS	µg/L	0.01		34	25	**31**	34	52	**42**
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01		34.74	25.58	30	34.74	-	-
PFAS									
Perfluorononane sulfonate (PFNS)	µg/L	0.01		<0.1	<0.1	0	<0.1	-	-

Comments
#1 Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 30 (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

Field Blanks

		Lab Report Number	1029918	1029918	1029918	1031201
		Matrix Type	Water	Water	Water	Water
		Field ID	RB01	TB01	RB02	TB02
		Date	20 Sep 2023	20 Sep 2023	21 Sep 2023	28 Sep 2023
	Unit	EQL				
PFAS - Perfluoroalkyl Sulfonic Acids						
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
PFAS - Perfluoroalkyl Carboxylic Acids						
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
PFAS - Perfluoroalkyl Sulfonamide						
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
PFAS - Fluorotelomer Sulfonic Acids						
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
PFAS - Sums						
PFAS (Sum of Total)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
PFAS (Sum of Total)(WA DER List)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
PFAS						
Perfluorononane sulfonate (PFNS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01

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